

104
**USING THE BEST PRACTICES OF INFORMATION
TECHNOLOGY IN GOVERNMENT**

Y 4.G 74/7:IN 2/6

Using the Best Practices of Informa...

HEARING
BEFORE THE
SUBCOMMITTEE ON GOVERNMENT MANAGEMENT,
INFORMATION, AND TECHNOLOGY
OF THE
COMMITTEE ON GOVERNMENT
REFORM AND OVERSIGHT
HOUSE OF REPRESENTATIVES
ONE HUNDRED FOURTH CONGRESS
SECOND SESSION

FEBRUARY 26, 1996

Printed for the use of the Committee on Government Reform and Oversight



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USING THE BEST PRACTICES OF INFORMATION TECHNOLOGY IN GOVERNMENT

MONDAY, FEBRUARY 26, 1996

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON GOVERNMENT MANAGEMENT,
INFORMATION, AND TECHNOLOGY,
COMMITTEE ON GOVERNMENT REFORM AND OVERSIGHT,
Washington, DC.

The subcommittee met, pursuant to notice, at 10:35 a.m., in room 2154, Rayburn House Office Building, Hon. Stephen Horn (chairman of the subcommittee) presiding.

Present: Representatives Scarborough and Peterson.

Staff present: J. Russell George, staff director and counsel; Mark Uncapher, professional staff member and counsel; Susan Marshall, procurement specialist; Andrew G. Richardson, clerk; and David McMillen, and Mark Stephenson, minority professional staff members.

Mr. HORN. Good morning. Today we look forward to hearing from many distinguished Government and private sector witnesses—individuals who represent a vast breadth of knowledge and wisdom regarding the management of information technology. A quorum being present, the Subcommittee on Government Management, Information, and Technology will come to order.

Today's hearing is the first in a series of hearings in which the subcommittee can use the information technology to make Government production more efficient and less costly. Our discussion will focus on best practices or lessons learned, both in the public and private sectors.

Information technology, without question, offers enormous opportunities to change and improve the way Government reforms. Work processes that were once bound in paper and red tape can now be performed in a fraction of the time, and often at a fraction of the cost. Integrating information technology into work processes can enhance decisionmaking, streamline production and speed program delivery. However, automating chaos, or an obsolete work pattern undermines the benefits to be gained from the application of new tools. The Federal Government spends approximately \$25 billion per year on information systems, and has spent about \$200 billion over the past decade. The stakes for the taxpayer are high.

Recently, under the leadership of Chairman William F. Clinger, Jr., the Information Management Reform Technology Act of 1996 was included in the final Fiscal Year 1996 Department of Defense Authorization Act. Signed by President Clinton on February 10 of this year, this legislation will provide the necessary tools to Federal

information technology managers so they can ensure that performance measures are applied and used and expenditures conform to budget and program management decisions. This legislative milestone represents a significant step toward reforming a system gone haywire.

I believe, if done properly, the insertion of information technology into daily Government operations can reduce administrative burdens, streamline processes, and decrease the time it takes for final delivery of goods and services to the American taxpayer. Furthermore, efficient and effective use of information technology equips managers with better tools to monitor program activity and spending, resulting in more accurate program accountability.

With this in mind, we look forward to the testimony of today's witnesses. They each have experience as leaders in using information technology to improve their organizations. It is my hope that through this hearing we can gain a better understanding of which tools can be applied in order for Federal departments and agencies to perform at the highest level.

I know we all look forward to hearing from our witnesses on this most important issue.

I would like to ask the gentleman from Minnesota, representing the minority, if he has an opening statement.

Mr. PETERSON. Mr. Chairman, I do not, but I want to commend you for looking into this area. I am here to learn and listen to some of our witnesses.

Mr. HORN. I thank the ranking member very much. The subcommittees of the House Committee on Government Reform and Oversight, by tradition, swear in the witnesses. So if we can bring forward the first panel Mr. Huber, we will swear you and then we are going to be very liberal on testimony this morning, so we won't limit you to the 5-minute rule.

[Witness sworn.]

Mr. HORN. The witness has affirmed the oath, and we are delighted to have with us Mr. Peter W. Huber, the senior fellow of the Manhattan Institute for Policy Research, and a columnist for Forbes Magazine. Mr. Huber, while I would prefer that witnesses not read all their statement and just look us in the eye, I am going to let you go through the whole statement, but hopefully you will look us in the eye and we will get to the questions.

STATEMENT OF PETER W. HUBER, SENIOR FELLOW, MANHATTAN INSTITUTE FOR POLICY RESEARCH, AND COLUMNIST AT FORBES MAGAZINE

Mr. HUBER. Mr. Chairman, thank you very much. It is a pleasure to be here. I have no intention of reading the entire statement and would much prefer to look you in the eye.

Mr. HORN. By the way, immediately after my introduction the full text is automatically put in the record and then we leave it up to you to give us the wisdom contained in the full text.

Mr. HUBER. Thank you. And under oath, of course.

I must start by confessing a certain level of ignorance about the details of Government operations. But I am a long-time student of information and telecommunications technologies and their impact on the private sector. I would like to make a few remarks about

those this morning. I do think the Government has much to learn from the adjustments that the private sector has been going through with the telecommunications revolution.

I think this revolutionary technology—and there is no other word for it, the power of the telecosm and the informational revolution is truly extraordinary and improving and increasing every day—is affecting institutional America at two levels. One has to think through them both.

First, information technology is letting people do business as usual but very, very much more efficiently. And that is certainly the first lesson that the Federal Government has to learn. The second, and I would like to talk briefly about both, is that information technology permits and ultimately requires fundamental restructuring of how organizations are built and how many people they employ and how much they rely on internal resources versus outside resources to do their work.

Let me begin with simple notions of efficiency. The talk of the paperless office has promised far more than it has delivered, but nevertheless both private and public America should be on a road toward a paperless world, the Government more so than anybody because it is so terribly clogged with paper today. If you look at what the major information processing private institutions are doing around us today, everywhere you look you will see them pushing as fast as they can to move people off paper and onto telecommunications bits. Banks are desperately migrating their customers off paper checks and off human tellers and into electronic banking. The process is still in its early stages, but there is absolutely no question where it is headed and why.

Our airlines are giving away free on-line reservation software. They are moving to electronic tickets, they are doing their best to move away from their basic paper interfaces and on to electronic means. Private organizations have grasped and recognized the imperative here. Information from suppliers and customers and partners must be received electronically if it is going to be processed intelligently. If you do still receive it in paper, the first thing you do is spend a lot of money converting it into bits, because that is what you need to handle the information intelligently.

While I confess that I have not done a comprehensive survey of the entire Federal Government, my very strong impression is that the Federal Government is years behind. Yes, the IRS lets me file my tax returns electronically if they are simple enough; yet, in dealing with one Government agency that I happen to know very well, the FCC, which one might suppose knows something about information technology and communications, if you want to apply to provide a video TV service in Oshkosh or Okefenokee, you still have to wheel in cartloads of paper. That is the ordinary way of doing business.

This table on our right is a tribute to the past. Much of the Government still relies on boxes and boxes and boxes of paper. For the Federal Government, going digital, going electronic, promises not a single but a double efficiency because so much of the information that comes into the Federal Government has to turn around and go straight back out because it becomes part of a public record, part of a notice of rulemaking, part of an adjudicatory docket or,

in fact, a record that can be accessed under the Freedom of Information Act.

If such a large part of your business involves taking in information with your left hand and handing it back out with your right, it is lunatic not to be trying to make that process electronic as quickly as possible. Any private institution, every private institution that is heavily engaged in similar functions like banks and insurance companies and airlines and so on is pushing as fast as it possibly can to go digital.

On that same theme, you maintain your records digitally, not on paper. The paper archives, whether it is for copyrights or patents or FCC licenses, or the Federal courts or the people who administer the Wild Horses and Burros Act or anything else, paper archives simply are an anachronism, particularly for an institution for which overwhelmingly the ideal is that the records be accessible quickly and cheaply and efficiently by the public.

I would have thought this would be a bipartisan and apolitical issue. It is a matter of efficiency and a matter of public access to move these records into the digital Information Age. But more fundamentally, and you have to do both halves of these, as institutions go digital they also restructure. If all the Federal Government were to do was to digitize and make electronic its current records and simply continue with the same institutional structures, the same numbers of employees, the same centralization here in Washington, that would be very modest progress indeed, and in some respects it would actually make things worse, because every institution that makes this digital transformation finds inevitably that large numbers of middle managers and middle employees are simply no longer required for their traditional jobs. A great number of people in the middle tiers of institutions had their jobs traditionally to convey information. They conveyed information from the top management down to the people who were doing the real work, and they conveyed information back from the people who were doing the real work up to the top management.

We now have at hand electronic tools as simple as e-mail, or groupware, or other electronic networks; we have in hand the tools to cut out a great deal of that middle-level infrastructure. We also have the tools, and corporate America is doing this with a vengeance, to decentralize. For perhaps 4 decades from the end of the war until the 1970's or 1980's, institutions were growing larger, corporations grew and grew. IBM and AT&T grew between them to employ 1.4 million employees, because it turned out in that kind of environment you really could be more profitable and in some respects seem more efficient by combining more and more things in one place, under one central management, and under one fairly autocratic top-down directional structure. It was sort of socialism in microcosm, and that is what built up the very large corporations.

That was efficient. Ronald Coase, a Nobel Prize-winning economist, explained why. But it was efficient because communication was inefficient. Now that communication is wonderfully efficient across this private spectrum, you see corporations downsizing and outsourcing, and it has become far more efficient to move things away from headquarters, to move things out into the field, out into

the branch offices, to outsource and to buy from independent providers rather than to do things in-house.

If you look at the restructurings that AT&T or General Motors or IBM or most of the largest corporations in America are going through, they are going through these restructurings because they have found that highly centralized, highly hierarchical management simply isn't efficient anymore. The lessons for Washington and the Federal Government should be fairly obvious. Not all of the analogies apply, but many of them do. There is a powerful case now in one agency after the next to move power and authority and personnel and responsibility out of this city out into the States, out into the branch offices and ultimately to outsource to other areas of government, the State and local governments.

In this election year it has not escaped notice from politicians of both parties, both the left and the right, that major corporations are restructuring in this way, and this is a politically very sensitive issue, and both political parties are attempting to exploit it. But I think, rather than condemning corporate America for restructuring in ways that are being impelled by competitive realities and technology, the Federal Government itself should be learning from these restructurings and in many respects copying them.

Thank you very much.

[The prepared statement of Mr. Huber follows:]

Testimony of Peter W. Huber
Senior Fellow
Manhattan Institute for Policy Research
52 Vanderbilt Ave
New York, NY 10017

AT&T makes headlines by divesting two major pieces of its business and firing 50,000 people. Large corporations everywhere are restructuring in similar if less publicized ways. Politicians of the left and right, from Robert Reich to Pat Buchanan, proclaim that government should put a stop to it. They have it backwards. The federal government should be learning from the private sector, and copying it.

The adjustments required are often painful. They involve fundamental changes in organizational structure. They affect tens of thousands of jobs. They require scrapping familiar ways of doing business. But many of those familiar jobs and familiar ways have been overtaken by revolutionary advances in information and telecommunications technologies. Institutions and governments alike must adapt to these changes or be overtaken by others who do.

Accept bits, not paper. Banks are desperately migrating customers off paper and on to automatic tellers and PC-based software. Airlines give away free on-line reservation software. And yes, the IRS lets you file and pay electronically. But if you want a license to broadcast | Love Lucy in Okefenokee, you still have to wheel cartloads of paper into the Federal Communications Commission. Where the paper then sits in the halls in dusty boxes, most of it never read at all.

Virtually every private organization of any size has recognized that the information it receives from suppliers, customers, and partners should be received electronically. For government there is a double imperative to insist on electronic input: Much of what is received must immediately be made available to the general public, as part of rulemaking record, or an adjudicatory docket, or in response to

demands under the Freedom of Information Act. Any private sector organization attempting to manage the vast volumes of information that flow in and out of the federal government would already have migrated most of it on to standard electronic formats, filed by on-line postings to government bulletin boards, and accessible (wherever appropriate) on the Internet and the World Wide Web.

Maintain bits, not paper. Paper archives -- for copyrights, patents, the Library of Congress, the federal courts, and the bureaucrats in charge of the Wild Horses and Burros Act -- are an expensive, impermanent, and inaccessible anachronism. If the record is worth keeping at all, it is worth keeping the cheap way, which is electronically. The longer government agencies wait to make that inevitable transition, the more expensive the transition will ultimately be.

It is ironic -- and also ridiculous -- that it is easier to access my personal home page on the World Wide Web -- than it is to locate most routine records of the federal government. I wrote this testimony on a word processor. I used CompuServe to e-mail my testimony to one of my assistants. He will post it on my home page later today (<http://khht.com/huber/home.html>). Thereafter, 30 million Americans will be able to read it instantly, if they choose to. I was delighted to see that this committee also has a home page, and asked me for an electronic copy of my remarks so that they could easily post it there too. I was mildly disappointed, however, that the committee didn't provide an e-mail address as an alternative to physical transport of a disk.

Yet we must recognize that most of the federal government isn't close to operating this efficiently. Paper remains the norm. Even such basic things as voice mail, which vastly improve ordinary telephone messaging, are not yet widely deployed.

Congress should enact the ultimate paperwork reduction act immediately. Let anybody file any federal form by e-mail, disk, or posting on a Web page or bulletin board. The less you want to communicate with the government at all, the clearer your right to file things efficiently -- i.e., electronically -- should be.

Publish bits, not paper. The government printing office should stop printing entirely, and the sooner the better. Not because people will read everything on screens -- they won't. But because the only proper government role in the publishing business is to make appropriate government information widely available. On-line publication does that; thereafter, the private sector can easily republish as it sees fit, on paper, CD-ROMs, digital tape, or any other medium.

So far as government operations are concerned, there should be no more dead forests of Federal Registers, Codes of Federal Regulations, or U.S. Reports. Send the information out only in streams of cheap bits. Let recipients and secondary distributors print out the product, if they must. Most of them won't. Quite the contrary: America spends billions today converting government paper back into the bits that people with a bottom line depend on to process things efficiently.

All of the points noted above are just obvious, cost-efficient ways of streamlining existing government operations. Every private sector institution involved in comparable activities -- banks, insurance companies, hospitals, and private educational institutions -- are implementing changes like these as fast as they can. But the information revolution makes possible -- and indeed demands -- far more fundamental change.

In the 1940s, James Burnham wrote in The Managerial Revolution that the future promised a new kind of planned, centralized, hierarchical, and very stable society, ruled by an oligarchy of business executives, technicians, bureaucrats, and soldiers. The complexities of the modern world couldn't be controlled any other way, Burnham believed. He was right, for a while. Corporations and government institutions grew larger and larger, more and more centralized, more and more hierarchical. The largest of the larger were communications and computing companies. By 1984, AT&T and IBM, between them, had 1.4 million employees. They controlled the two most lucrative and powerful businesses on earth.

Then the technologies that those two companies had mastered, and for a time largely controlled, reversed everything. AT&T was broken up twice -- once by the government, and a second time by its own managers. In a desperate scramble for survival, IBM broke itself into autonomous units and began spinning off some of its more successful divisions. "The idea of open systems -- that computers should easily share things and basically behave like friends -- is what everyone is aiming for," IBM's advertising now declares. Instead of a computer screen, one IBM ad shows two

sliding glass doors opening out on a vast expanse of peaceful ocean.

As I wrote in an April 1992 Forbes column, the computer and telecom revolutions are impelling fundamental disaggregation of the old mega-corporations. What information technologies did to the Soviet Union they are now doing to the old-style American corporation. With telephones, facsimiles, and electronic data interchange, with computers and broadband networks -- the real instruments behind perestroika in Eastern Europe -- a fundamental restructuring of the large corporation is now both desirable and inevitable. The giant corporation is being disassembled into efficient parts. It is being cannibalized, not by Wall Street predators but by the market itself.

To understand why, think about why corporations exist in the first place. As Nobel economist Ronald Coase explained years ago, a firm makes sense when the cost of keeping track of lots of little day-to-day transactions outweighs the benefits. Individuals work harder and more efficiently when they work for themselves, but you can't build a car on your own. In theory, every secretary, accountant, lawyer, engineer, and assembly line worker at General Motors could be an independent contractor, but keeping the enterprise running would then become impossibly complex. The garment industry can farm out sewing and knitting and pay workers by the piece, but car manufacturers have to run a sort of corporate commune.

Like it or not, however, that then means Soviet style central planning. Who does what, where, and when inside a firm is decided not by competition and contract, as it would be in a market, but by administrative decree. From the assembly line to

the executive suite, the individual corporate citizen is paid a salary that is only vaguely related, if at all, to how (s)he affects overall profits.

Telecommunications and computers are now changing everything. Electronic machines make it possible to count every keystroke typed, every mile driven, every bolt tightened, every package delivered. And every bolt and package now occupies a cell in some larger accounting spreadsheet. The complicated connections between the top line -- the employee -- and the bottom line -- profit -- are getting clearer day by day. People who build the radios for your cars, or drive your delivery trucks, or prepare your payroll, can now be compared very directly with outsiders who are paid for radios delivered or payrolls prepared, not for hours worked.

At the same time, the obstacles to buying goods and services from outside the corporate commune are being eliminated by advances in computerized inventory control, data interchange, billing, and electronic mail. Coordinating multiple outside providers used to cost more than it was worth, but every advance in new communications and computer technologies changes the equation. Yesterday it was often hard to tell if an outsider would pay his bills or perform on time; it was difficult to maintain flexibility, to double an order at the last moment, to change the specifications, to extend a line of credit, or to reassign people quickly from one job to another. Now, however, you can pass orders, check credit, and pay bills almost effortlessly. The technologies of communication slash what economists call "transaction costs." As these costs decline, so does the traditional logic for keeping business inside your own cozy corporate community.

Thus, car manufacturers are becoming efficient assemblers of parts provided by hundreds of independent suppliers. Secretaries, accountants, designers -- large numbers of people who provide an enterprise's support services -- are being replaced by independent outsiders, knitted together into an efficient whole not by corporate autocracy but by the market and the electronic network. Even if they aren't, the fact that they can be changes everything. Employees now realize they are now competing against outsiders who sell goods and services by the piece, rather than loyalty by the hour. Good managers now know they can turn to the market when they finally tire of taking on a clogged white-collar bureaucracy or blue-collar union that still thinks like a Soviet ministry.

We are therefore witnessing a steady decline in the number of employees per corporation, at least among the largest enterprises. Somewhat paradoxically, we are also seeing new levels of specialization, with few people running larger enterprises. With technology in place today, a handful of the very best hospitals could already read every difficult X-ray and interpret every complex CAT-scan; the best experts on the most obscure diseases could likewise examine patients at any distance. With finance and law, entertainment and education, providers of superior services can market their talents to any number of buyers at any distance. It is also going to get harder and harder for the Employment Police, wage commissions, discrimination watchdogs, and the rest, to stand between workers and market forces.

All of the logic that applies to the megacorporation applies with even greater force to the federal government. Traditional government represents the ultimate in

centralized, bureaucratic control. Perhaps there was a day when that was the most efficient way to manage some things. But that day is now past. If it faced real competitors and were truly accountable to private shareholders, the federal government would be restructuring in the same way as have AT&T or IBM.

Fire middle managers. The ones with titles like Assistant Deputy So-and-So, or Under-Somebody-or-Other. In corporations and government agencies alike, jobs like those exist to convey information from the top down, and from the bottom back up. But most informational midwives aren't needed any more. E-mail, electronic data interchange, groupware like Lotus Notes, and wide-area networks do the conveying far better. Nowadays, the middle, pass-the-paper tiers of the human pyramid just get in the way of the communicating machines. This is why corporations are flattening down so fast. Government should be too.

Decentralize. When you're rebuilding operations around new, fast-changing technology, the rebuilding has to begin at the edges, not the center. By the time headquarters works out a grand scheme to equip the whole enterprise with PCs or Macs, needs will have changed, and so will the hardware. General-issue solutions won't do; there are too many choices at hand, and they change too quickly. Decisions once made at the Washington national office should now be made in Oshkosh and Okefenokee. For a steadily growing number of employees, desks and water fountains disappear completely. Your office is your laptop computer. You report to the boss

twice a day, by modem.

Outsource. This is decentralization carried to its logical limit. Through most of this century, corporations grew steadily larger and more centralized because that was the most practical way to coordinate large numbers of people and long chains of supply. But with today's networked computers, Boeing builds a 777 jet in a dozen different countries, relying on a sprawling collection of independent contractors. National bureaus like the FBI can accomplish far more as national information clearing houses than by putting more agents on the federal payroll. The ultimate leverage for national headquarters isn't people, it's information. In the FBI's case, for example, electronic compendiums of fingerprints, DNA signatures, mug shots, arrest records, and profiles of serial killers, are instantly accessible on-line by state and local law enforcement officials on the front lines.

Today, millions of private sector employees are living through wrenching changes of this kind, as private industry responds, as it must, to the imperatives of new technology and new competition. If IBM had chosen to make such changes in the 1980s, it wouldn't have been forced to make much harsher changes in the 1990s. If American enterprises don't change in response to new market realities, enterprises in Singapore or Stockholm surely will.

The federal government faces no similar pressure from competitors. But it does have to face the voters. And though most voters have not studied Burnham or Coase,

the country has grasped that technology is fundamentally changing the way people - including people in the government -- must work.

In this, the age of information, government should be streamlining, downsizing, and outsourcing faster than anyone. The imperatives here aren't political, they're technological. In the age of hyper-efficient communication, power and responsibility should be moving wholesale from the middle out to the edges, from Washington toward state capitals, and from state capitals on out toward local governments. Every corporation that is trying to run its business efficiently today is restructuring in just that way.

Mr. HORN. We thank you. Let me ask the gentleman from Minnesota if he would like to begin the questioning. OK.

One of the ironies I think in the decentralization movement that comes with the type of software development you are talking about is that where we have field offices at a local level, which does give real person-to-person contact—and I think this is particularly important in the Social Security Administration—and where we have had field offices, branches, embassies, whatever in history, the further away you get from the capital, often the more you can innovate in various policies. What the software now permits, however, is a tremendous centralization of decisionmaking and rapid communication: You can plug in your people in the various regions or field offices, whatever.

How do you see the revolution you are talking about affecting permanent decentralization, or might we also use the same processes of software to have in a way permanent centralization, which a lot of us are trying to get out of this city into the countryside where you can be free to innovate, make decisions that might be different from what you do in another State, et cetera?

Mr. HUBER. George Orwell wrote the book in 1948. His tremendous fear was that the communications technology of the future would centralize everything under Big Brother management. It would make powerful a very small number of domineering ministries that would dictate everything out to the edges. That is a concern. I think it is something one has to watch for.

It is possible that the Washington hierarchy will become even more intrusive in branch offices than it has in the past. But I think, given the appropriate mandates and encouragement from Congress, the trends will be exactly the opposite. The new information technology does let you outsource. We have, just to pick examples out of the blue, EPA attempting to track hazardous wastes all around the country. In fact, Congress enacted a manifest system for this. There is one vision of things that says information technology will let all of this be run from three blocks up from here. But if we let technology move in its natural and efficient direction, the tendency will be the opposite; it will be to return responsibilities like those to States and municipal governments, with appropriate filing and recordkeeping and a flow of information back to Washington, to make sure that standards enunciated by Congress are complied with.

So I think if Congress gives the flexibility and the initiative, the tendency certainly in the private sector has been to decentralize and move authority out. If you don't give that flexibility and essentially leave many agencies structured as they are now, you could see things moving in just the opposite direction.

Mr. HORN. In your testimony you propose that Government should let anybody filing a Federal form with the Government be able to do so by e-mail, disk, Web page, posting, whatever. A major impediment to such a policy is the issue of the authentication of transmissions because of Government restrictions on the private use of encryption technology. Would you elaborate on your views on encryption restrictions?

Mr. HUBER. The Government—I don't know how much of it happened under this committee's oversight—but the Government has

been trying for some time to limit things such as the V-chip, et cetera—not the V-chip, the clipper chip—to impose things like the clipper chip and limit priority encryption. Those efforts were misguided. They have been overtaken by the private sector anyway.

The private sector is perfectly capable today of doing on-line banking, which involves quite a number of verification and authentication issues. I, on my computer today, and 10 million other Americans can transfer large sums of money from one bank account to another, and trust me, the banks are very concerned about knowing who is moving that money. The software is in place, and if it is not in place it can be developed quickly.

If there is the slightest will in the Federal Government, I guarantee you electronics can be authenticated far better than any pile of paper ever can. It is ultimately much easier to forge a paper and to masquerade on paper than it is to do it in an intelligent electronic environment.

Mr. HORN. I happen to be pushing an electronic environment piece of legislation based on the California experience that you perhaps know about. It is already there between the State Environmental Protection Agency and business. They have worked on common coding and everything else, so you don't need to chop down another forest and put another warehouse under lock and key in Sacramento, and it is great for the media and others that need to know. What is this report? You can find it very rapidly.

I find I have some resistance from some that represent senior citizens who say we don't want everything to be electronic banking, and I am willing to make exceptions on that. But say you get to some part of this country where their system's an ATM or whatever; what do we do to handle those problems?

Mr. HUBER. There is no question that there is a transitional time, and it tends to be an expensive time when you are doing everything both ways—my 79-year-old mother is not going to be filing tax returns on a PC anytime soon—and so we will clearly go through that transition. I might add that for many of those people, there are very good private intermediaries that will still provide in the private sector the face-to-face contact but then be an interface into the electronic world and process tax returns and refunds, et cetera, much faster. Even the elderly in large numbers are now getting direct deposit of Social Security, and that transition was not easy but has greatly improved the flow of money and the reliability of deposits and protections against theft.

Mr. HORN. Protections against theft I think is particularly important. There are thousands of checks that are being intercepted by absolute miscreants of the first order. Then, of course, you have to go through the huge hassle of what happened to the check. That is a major plus for getting the money in the bank so the person can write the checks on their own.

Mr. HUBER. Yes. And getting the money back into the Federal Treasury as well and dealing between the Federal Government and suppliers. To the extent there are analogies—and I believe they are powerful—between the Federal Government and General Motors or IBM or AT&T, if you look at what these people are doing, they are doing everything they humanly can to make that transition to all electronics. I cannot say no paper tomorrow. You can give people

the option of no paper tomorrow, and why we don't, simply mystifies me. Certainly any mandatory filing, any filing done under duress, at the very least, we should give people the courtesy of saying send it by e-mail rather than hiring some K Street lawyer to type it all up for you, at enormous expense.

Mr. HORN. As technology, as we know, constantly improves, unit cost decreases. There is increased capacity, faster response, greater reliability. When is it time to decide to stop waiting for technological improvements and proceed with technology initiatives? How do corporations decide between using the technology which may be unproven, but state-of-the-art, and the technology that is well established?

Mr. HUBER. The time is today, if not yesterday. The main problem you face is simple. This technology will not stop improving in our lifetimes. There is no inherent limit to what the microprocessor can do. There is no inherent limit to the bandwidth we can put on wire or wireless media. In every media, every 2 or 3 years we are doubling the power of everything. If anybody in this committee or in this city thinks—two fatal mistakes you can make are, one, I am going to wait until it is perfect; that will be in the next world, not in this one. The second mistake is, say I am going to hire somebody highly centralized to choose the perfect system for Washington and we will work it out in a huge central process and then give it to everybody. The smart people like the DOD, on this matter at least, have already gone beyond that. You cannot centralize the choice here, and you cannot wait for perfection because you will wait forever either way.

Mr. HORN. I simply want to be the data site, not the alpha site. I have been through being the alpha site, and I regard that as never again.

Mr. HUBER. I suggest you let a few people in the Government be the alpha sites too. For instance, DOD is prepared to be the alpha site because if you want to be No. 1 you have to be there first. I sympathize with that, but if you wait to be the gamma site or way down the list, that is too late.

Mr. HORN. You are right. You have to somehow get innovation still in it and yet make sure the oversales propensities of those in the software and hardware industry have reality.

Mr. HUBER. But there is a fairly good reality check on these things. It is a fairly safe bet that if e-mail is working for 20 to 30 million Americans it is mature enough. There is Compuserve and AOL and so on among those you may want to choose, but if 10 or 20 million people in the private sector are using Lotus Notes or are using a group or products of one kind or another, have some faith. You will be far better off encouraging agencies to implement these things off the shelf than having GAO or somebody saying let's invent one especially for us and make it uniform for the entire Government.

Mr. HORN. I agree. That is the philosophy I think we are trying to pursue both in the Transportation and Infrastructure Committee where we inherited the FAA mess, which a lot of it could have been off the shelf, networked together and been done, and not billions of dollars cost overrun because everybody was reinventing the world in the process.

I have gone through that myself as head of an institution, and seen it on Capitol Hill. We have certain things we would like in the software, and everything seems to be a major issue when you get into this with the firms that are servicing this. Either they can't or don't want to do it or drag their feet. My feeling is as I look at how you serve Members of Congress up here with competition in the private sector, they leave a lot to be desired. I won't get started on my war stories on that one.

One weakness of Government information systems development is the apparent tendency to focus on the unique characteristics of an activity rather than the many elements of a function which other organizations have had considerable experience performing. Examples include the agency financial management systems, and as a result some agencies effectively end up trying to reinvent the wheel rather using systems and processes that are available off the shelf. How have the corporations combated this form of not-invented-here syndrome? Have they said, "Go out there and find it in the market, and see if it has already been tested?"

Mr. HUBER. That has been half of it. Overwhelmingly, with rare exceptions, people are buying off the shelf. More important is outsourcing, because it turns out that the outside experts, whether they are accounting groups or networking groups, are serving many corporations, they are learning from many other institutions, they are learning from the collective experience of the private sector.

There are a few agencies in this city I know well, like the FCC, and it is utterly clear to me that the best thing they could possibly do would be to outsource large segments of their activities whether it is the auctioning spectrum, which is basically something that the private sector knows how to sell things, or whether it is maintaining accounts. Even the process of making the painful and, granted, expensive conversion from paper to the digital world, you try and invent it internally and then try to buy the software internally and try to get through the reams of the bureaucracy. Basically the existing system becomes the main impediment to making the necessary changes.

You have to work systematically at identifying, and this is what the private sector has been doing, identifying the pieces of your organization where you add value, where you do the unique activity that nobody else can do better. Certainly there are some things that the Federal Government still must do. We are not going to sort of privatize the Navy here. But you have to define that, and then identify equally clearly the pieces which are better done on the outside and move them out. Then, when they move out the employees move with them.

Mr. HORN. I now yield to the gentleman from Florida, Mr. Scarborough. Do you have an opening statement and wish to question the witness?

Mr. SCARBOROUGH. I don't have an opening statement. I have a brief question, and hopefully you haven't answered it before I came in. If so, please indulge me and give me some insight on it.

We have heard a lot about Government downsizing and the need to become more efficient, but it seems to me we are just talking in sheer numbers. Isn't the fact of the matter that if we do move toward the Information Age in the Government to learn from the pri-

vate sector, doesn't that mean, not only are we going to be able to downsize more by getting more Federal employees off the Government payroll, but aren't we going to need a more highly trained work force; and how do you suggest that the Federal Government goes about training a work force to be able to respond to some of the challenges that are going to be facing them in the coming years?

Mr. HUBER. Well, I think it is certainly true that you will need people who welcome, accept, and are willing to use the new technology, so there is an attitudinal issue which is fundamental. But I think it is a mistake to say gee, information technology—I don't know how to design a Pentium process or therefore it must take an MIT doctorate to use this technology. The beauty of much of this technology is when it reaches a certain point, and a lot of it has reached that point; it is usable by lots of ordinary people.

The car. When Ford was making the Model T, you had to be able to get under the hood and fix a carburetor to make the thing run. That is not true today. You don't have to have an engineering degree to drive a car; lots of nonengineers do, and information technology is reaching that point as well. It does not take a great deal of training to use e-mail instead of a Xerox machine or e-mail instead of a facsimile machine. I am not trying to say we don't need that. I think we do. I think we have to take seriously the employment and transitional process. But I think you have to keep it in perspective. It is a mistake to say gee, this stuff is so tremendously demanding that our current work force can't handle it. In many instances it makes things easier for the work force, not harder.

Mr. SCARBOROUGH. So you are fairly confident that the Federal work force that is employed today in most of the bureaucracies can handle some of the challenges that would have to be overcome to get them adapted and move them into the 21st century Information Age?

Mr. HUBER. The parts of that work force that are still needed I think can be found in this city or can be employed. But you must recognize at the same time, a great segment of that work force, a great segment of that middle management, has historically existed for a single purpose; which is to convey information in paper from the top down and from the bottom up. I don't think that segment of the work force will wish to master the new technology because basically it threatens their jobs.

If you look at a typical agency today and a typical rulemaking process which involves an enormous inflow of paper into that agency, a giant shuffling about of it and then an enormous outflow again, there are very substantial segments of the work force that is processing that flow that shouldn't be processing it anymore. An efficient private corporation would not have that many people doing it.

I have great sympathy for these people, but that is why AT&T in a single day says 50,000 people are redundant now, and other phone companies and computer companies and insurance companies and banks and all of the other information handlers of our society are reaching that conclusion. I think there will be great resistance from much of the Federal work force. Efficiency threatens many people in this town.

Mr. SCARBOROUGH. In your opening statement you said that Robert Reich and Pat Buchanan were taking exactly the wrong message out of the AT&T downsizing.

Is there any way you can project, even within 10 percentage points, the percentage of Federal workers that may not be needed if we were to run this ship as efficiently as, let's say, AT&T?

Mr. HUBER. I would try and first of all distinguish the civilian from the military sector. But putting aside military, which is a universe of its own and even conservatives like me think probably should be a Government monopoly; putting that aside, in the civil sector to the extent you can reasonably analogize many parts of the Federal Government to the information-intensive marketplace like AT&T and IBM and insurance companies, you should be talking steady reductions in force of 5 or 10 percent a year for a good number of years. We should be looking at 20, 30, 40, 50 percent downsizing if the analogies with those sectors hold, and I think there is every reason to suppose they do.

Mr. SCARBOROUGH. So you would not say it would be irresponsible or mean-spirited for Congress to begin downsizing Federal employees. In fact, you would suggest it would be irresponsible of Congress not to look toward the 21st century and do exactly these type of things.

Mr. HUBER. It would be irresponsible not to recognize and take advantage of the technical possibility. I don't for a second think that we will lower total employment in the country; we will increase it. But within these monstrously large institutions like the Federal Government and its private counterparts, of course, they have to be downsizing radically. Everybody who is accountable to a real payroll or a real shareholder is doing that today, and the Federal Government should be on the same trajectory. I don't mean to be callous about the disruption and the pain that entails for the people involved. These are disruptive times; but you still have to make these changes.

Mr. SCARBOROUGH. Thank you.

Mr. HORN. Following up on that line of questioning, my own experience in a university, where we had an acquisition library staff of perhaps 35 people for a library that purchased maybe 42,000 to 50,000 books a year, over time. We could get that down to three acquisition librarians with extensive computerization, sharing of acquisition entries, which you now have nationally under several systems. Usually the mistake Government budget agencies make when they ask for that tradeoff is an unrealistic time period; that you need to run parallel tracks on some of this until you make sure whatever you are doing works. Then it seems to me that you can get the economies and you can also retrain people out of that job into more service-oriented jobs. For example, in the case of a library, the displaced workers are helping students understand how to utilize reference works. That is exactly what has happened in most university libraries. But usually the budget people have been dead wrong on the time it takes to accomplish this. As a result, not all opportunities have been met in the institution that is doing it.

Mr. HUBER. It is easy to oversell this and I am sure I have been guilty of that. However, I would say at the same time there are some things that can be done quickly. Some of the transitions from

paper to electronic can be done today if there is a will. I agree with everything that you said. But one also has to keep in mind that it is often the people in place now who most resist the change because they are not fools. They see its implications, and they worry about them. They have reason to worry about them.

Mr. HORN. That gets us into what affects decisions in most corporations is the organizational culture of that entity. Do you have advice from looking at these experiences around the country of what is the best way to assess the culture and to work through that culture to have change become possible?

Mr. HUBER. The single most potent force has been the wake-up call of competition. IBM adjusted too late to the microprocessor and it went through a massive and very painful adjustment late in the day because it recognized that things were moving out of the main-frame and into the microprocessor. The Bell system moved too late and the Government had to break it up. I think the biggest challenge you face is that there is no equivalent to Apple Computer beating at the door of the Federal Government. But perhaps there is. I think what invigorates people to do a better job is the real tangible threat that somebody else is going to do it instead. In this case, we have more than one Government in this country. We have day-to-day choices that are made between States and the Federal Government, between local governments and the States, and by allowing at least some semblance of a competitive process, and if it doesn't get done right, if it doesn't get done electronically, if it doesn't get done efficiently, out it goes, and we will try it in the State capitals and local governments and vice versa. If you get some sort of competitive structure, there is nothing that changes corporate culture faster than a competitive stress.

Mr. HORN. Along that line it seems to me we are also talking about individuals, private entities, nonprofits, all doing certain functions of government. The poverty program established back in 1964 tried to get around established organs of government by creating some of these nonprofits, and the end result was you did train a new generation of managers, entrepreneurs. You didn't necessarily solve the problem of poverty. On the other hand, you gave competition to Government.

Historically within Government, when the Tennessee Valley Authority was established, that was fought by every bureaucracy in Washington. The Department of Agriculture fought it, the Department of the Interior fought, because they were duplicating them but they had the mission that inspired them to think of Government on a regional basis, and to do innovative things the Government bureaucracies here simply weren't doing.

Do you see any other areas where Government services might be delegated outward from this city? Because certainly that is the aim of those of us in the current majority, is to get the power out of the city down where the people are to solve the problem.

Mr. HUBER. My area of expertise is telecom and information technology, and the agencies I know best are the ones like the FCC that handle those things. At least from those case studies for what they are worth, it is perfectly clear that a very significant fraction of what those agencies currently do need not be done in Washington and quite possibly need not be done in Government at all, can

be done by the private sector. Some of it is as simple as sort of processing paper, moving it around. Some is more elaborate, like handing out property ownerships in Spectrum rather than eternal licenses. The nature of the license is that it comes up for renewal every X years and somebody has to process the paper again and again. So I think across the spectrum of Government you can look at activities that are recurrent when they need not be, activities that are paper clogged, when they could be done much more efficiently electronically, and on every one of them ask do we still need this structure here in Washington to consolidate the information, or can the main work be moved outside with perhaps a monitoring function.

There is probably no agency in this city I support more than the FBI. But you look at an organization like that and you ask what is the maximum leverage for an agency like that. I am fairly confident it will turn out to be an informational function whereby they maintain data bases, they get on line with local law enforcement officials, they move out genetic fingerprints and old fashioned fingerprints, and essentially an informational function rather than endlessly building up—I support every employee they have, but if you have to make that kind of tradeoff, I am fairly sure in those instances you will find the tradeoff should be emphasizing the communicative and information functions and perhaps spending less on number of employees and the more traditional human and paper-centered functions.

Mr. HORN. I yield to the gentleman from Florida and ask him to preside while I return a phone call.

Mr. SCARBOROUGH [presiding]. Following up on something you had said, you had said that one of the problems that the Federal Government had in being pushed toward competition was that there wasn't an Apple computer to compete against. I would suggest that the Federal Government has numerous outside pressures pushing in on it that I think would be even more daunting than an Apple computer. We could begin with a \$5 trillion debt which obviously is something that we are fighting against.

Second, I have found myself having my shoulder cried upon by Federal employees back in my district, knowing that I am a very conservative Republican, so I guess they are truly desperate crying on my shoulder, but saying that there is a real disconnect between, let's say, people who work for the IRS and those people that are filing tax returns, and those people that work for FEMA and those people that are asking for assistance. There is a growing hostility; people who have worked for IRS and other agencies for 15 or 20 years tell me there is a growing hostility and many are fearful for their well-being.

One way to tear down the walls have that have been built up between the bureaucracies and the people who are trying to get service from bureaucracies is to move forward with an information revolution that would stop what veterans call the slow roll, where they send a piece of paper in for a claim and 6 months later they get a response that it was lost, and it seems to me that technology would be another way that we could act positively to tear down those walls.

Mr. HUBER. I hope—I would very much like to believe that most of the Federal Government feels it faces competitive pressure today and is responding to it. That is great. If it is the reality——

Mr. SCARBOROUGH. I don't think it is. You are saying it should.

Mr. HUBER. It should be. I think the people who are confident of their skills in Government and who are confident they are delivering a necessary or good product will embrace this technology and will be glad to implement it and will see it as part of providing better service to the American public.

It is equally clear that there are significant numbers of people, and your earlier question adverted to them, who served a real function in days past. It was an information conveying function using the old fashioned technology, paper technology and spoken word and telephones or voice telephone, no voice mail, no electronic mail. Those people—particularly if they are intelligent, they will recognize that this transformation is a threat. It threatens their jobs. Then the real challenge for them will be to see how public-spirited they are and how much when push comes to shove, how prepared they are to say yes, there is a more efficient way to do these things and that more efficient way doesn't involve me.

I look at the Government Printing Office, which I have no quarrel with at all. I think I put this in my testimony. If not, I will say it here. I think that office is probably an anachronism. Government, if it has information to share with the people can put it on-line rather cheaply and rather simply, and then any number of people in the private sector can download it and do anything they like with it, republish it; it is not copyrighted. They can redistribute it electronically, and that means if you are sitting—I am not trying to pick on one office, but if you are sitting in that office you have to make a real call; do I make an orderly transition in a year or two to basically make Government Printing an on-line activity, which involves some computers and a few people to look after them, or do I continue running my printing presses, et cetera?

In this committee itself, I notice you kind of have a dilemma. You asked me for a hundred dollars worth of paper here, which I was happy to bring. I would hope that a year or two from now, we would be confident enough to say no more. I was late in getting my testimony here and we sent a messenger because I couldn't find an e-mail address on your letterhead.

I understand while making the change, but these things should be done, and I suspect there are people in your offices who might say that paper is what I carry around these days and if it goes, maybe I won't have anything else to do. Those choices will be made a thousand times over in every office in this city, and the incentives are pretty mixed.

Mr. SCARBOROUGH. Unfortunately, I have little confidence that many people will be willing to step aside for the good of the country.

Just so we aren't picking on any particular party, I will cite, in closing, an experience, what happened in the eighties. We have a Presidential candidate who is a former Secretary of Education, and we also have another former Republican Secretary of Education who has come out and endorsed him and running his campaign advocating the elimination of the Department of Education. Yet while

they were there during the 1980's, the budget exploded from \$14 billion to \$32 billion.

Mr. HUBER. This is above my pay grade, but I will echo one sentiment. Paper is a nonpartisan equal opportunity employer. It employs Republicans and Democrats, and you know, if your job is carrying it around, you tend to resist stopping that.

Mr. SCARBOROUGH. Exactly. Thanks a lot.

Mr. HORN [presiding]. Did you ever hear of the International Association of Professional Bureaucrats headed by one James Boren?

Mr. HUBER. I think I might even have been a member of it at times.

Mr. HORN. I received its top award for destroying red tape and a plaque immunizing me from what bureaucrats would say as a result of that. But that was 20 years ago. That red tape was there then, heaven knows.

One of the unique challenges that the Government faces is that a lot of its activities, as was suggested earlier by you and others, are natural monopolies. When an individual company makes a mistake with technology, another company can step in to fill the vacuum. However, when a Government agency such as Defense, Internal Revenue, others, builds a bad system, there is no one ready to replace that bad system. Does the natural caution that this seems to produce in Government doom Government to always lag behind the private sector in using the latest information technology? What can we do about it?

Mr. HUBER. I fear the Government will lag behind the private sector, but the question is how far back are you going to lag? One should try and minimize the gap. It is one thing to lose the race. It is another not to enter it at all. I do know this natural monopoly argument has been a potent one in this century.

The telephone system used to be a natural monopoly. Every economist in the country would swear to it. We finally tried competition and we are trying a whole lot more now because Congress, just a few months ago, passed legislation that simply repudiated that legislated presumption.

The computer industry used to be a natural monopoly. In this building hearings were held in the 1960's wondering if IBM was simply going to take over the whole world because everybody knew mainframes were more efficient than anything that could be imagined. It didn't work out that way, and the notion that things have to be done in Government and have to be done in this city of Government is a very tenacious one. Try the alternative. People are often surprised at how many of these natural monopolies will accommodate a whole lot of competition and private sector initiative. At the very least we have competition between State and Federal Governments or local authorities and State governments.

There are other Government institutions around. There are certainly plenty of private institutions around. Spread the opportunity to do the work around and you may be surprised at how many of these monopoly functions cease being monopolies.

Mr. HORN. Of course, historically, Franklin Roosevelt did just that, setting up some rival Government agencies to compete with each other, Harry Hopkins to head the Public Works Administration and Harold Ickes used to head a comparable administration,

and he built in competition for budget resources and everything else. But that is Government with the monopoly being broken and at least getting an oligopoly in the process.

Mr. HUBER. It is a step forward. If you involve the States and other more autonomous branches of government, the competition may be more honest.

Mr. HORN. The last question I have and then I will ask my colleagues if they have any more. You know a lot about technology that is under way now that we haven't really seen on the shelf at this point. As you look at some of that technology, and whether it be software or hardware, what do you think the impact of that would be on Government, and is there something coming down the line that will even be more revolutionary than the age we are in now?

Mr. HUBER. I absolutely guarantee you, Mr. Chairman, that 10 years from now you will look back at everything you have within reach now and say how on earth could I live with something so primitive. When I was a freshman at MIT in 1970, we had an IBM 1130 for 250 students.

My 7-year-old daughter has more on her desk today, and 10 years from now it will be 10 times as powerful. We do know the general trends. The processing power will continue to increase, the band width will continue to increase, the networking of it all will continue to increase, and I don't think for this committee's purposes you need more than the general trends.

The general trends are go digital, flatten out, downsize, outsource, the sort of fairly common buzz words that are sweeping the private sector today. If you recognize and accept those trends, it doesn't terribly matter whether they are coming this year or next or exactly how fast they can be implemented as long as one accepts them and works toward implementing them.

Mr. HORN. Since we are moving from the paper society in Government to a paperless, but electronic society, how are the scanning techniques to take the paper we have generated since the first Congress in 1789 and put that in digitally and be able to cross index it and all the rest so we can use the laws, the statutes, the debate when we want to find it? How is that coming?

Mr. HUBER. Sadly, for people trying to make decisions, it doubles in power about every 2 years. I have been buying these systems for 10 years off and on myself, and what is frustrating is your \$3,000 system for a single person becomes a paperweight every 3 years.

There are two things to say about it. First, the Government can stop the loss by not taking in more paper, taking in bits wherever possible from here on out. At least then you won't be arguing how to scan the mounds of paper generated between now and whenever you get around to buying your system.

The second thing you have to do is recognize it is an incremental process. You are not going to take the entire Library of Congress and digitize it overnight. On the other hand, you've got to start now recognizing that what you buy now will be obsolete in 2 or 3 years, but waiting those 2 or 3 years entails cost, too, so it is an endless juggling act, but at least you know the direction, and at the very least you know what the future holds and can stop taking in paper when you don't have to.

Mr. HORN. I yield to the gentleman from Minnesota. Any further questions? The gentleman from Florida, any further questions?

Mr. SCARBOROUGH. Just one question. Do you have any examples of any other countries' Governments that are moving forward more quickly than we are that would serve as a model for us.

Mr. HUBER. I am happy to say that every time I feel despondent about Washington and America, I travel abroad and am greatly bucked up. We are still leading the world. I know our private sector is, and as best I can tell our Government sector is, but this is damning with very, very faint praise, because to say we are doing better than France in this department, you know, or Albania is not something to feel tremendously proud of.

Mr. HORN. Our goal is to surpass Albania by this section. Thank you very much.

Mr. SCARBOROUGH. I just wanted to thank you. Great testimony and hopefully 5 years from now you will come back and we can see a little bit of progress this Government is making. Thanks a lot. Thank you, Mr. Chairman.

Mr. HORN. You are welcome.

We now have panel two, which we will take before we break for lunch, and I will advise panel three, instead of running this thing as we usually do like a sweatshop and starving to death, today we will be gentlemanly and break for lunch after panel two and come back and give panel three all the time they would like.

Panel two consists of Christopher Hoenig, the Director, Information Resources Management Policies and Issues, General Accounting Office. Dr. David L. McClure, the Assistant Director of Information Management and Policy Issues, General Accounting Office. You know the routine here. If you will stand.

[Witnesses sworn.]

Mr. HORN. The clerk will note that both witnesses affirmed, and we begin with Mr. Hoenig.

STATEMENTS OF CHRISTOPHER HOENIG, DIRECTOR, INFORMATION RESOURCES MANAGEMENT POLICIES AND ISSUES, GENERAL ACCOUNTING OFFICE; AND DAVID L. MCCLURE, ASSISTANT DIRECTOR, INFORMATION MANAGEMENT AND POLICY ISSUES, GENERAL ACCOUNTING OFFICE

Mr. HOENIG. Thank you and good morning, Mr. Chairman and members of the subcommittee. It is a pleasure and an honor to be here today to bring our perspective to discussion on information technology best practices. Let me take just a moment to introduce myself and my colleague.

I am Director of Information Management Policy and Issues at the GAO in charge of evaluating IT issues for the Federal Government, about \$26 billion in annual obligations. I was in the private sector for 10 years prior to GAO. I have run my own technology business as a senior consultant with McKinsey and Co. and worked with Fortune 100 top management teams on technology-related issues.

Sitting next to me is David McClure. Mr. McClure is an Assistant Director in my group and has had a wide range of efforts to evaluate agency implementation of IT best practices.

Mr. Chairman, since 1992, we have been working with senior management teams of a select group of successful companies and State agencies to identify what they consider success in using IT and would help them get there. From this point on in my statement and to be more informative to the subcommittee, I would like to refer periodically to exhibits which you should have in your packet entitled, "Information Technology Best Practices."

Let me begin with some brief background on our research, who we studied and what do we mean by success. Turn to exhibit 1 in the packet. It shows the organizations we have worked with, initially in 1-week case studies and subsequently in exchanges on topics of selected interest.

Exhibit 2, on the issue of success, and what do we mean by success, these are examples of highlights of what we consider successful outcomes from the improved management of information technology, increased productivity in the course of downsizing, improved customer service, higher returns on IT investments and lower risks of failure and delay and overspending. The details of our research are outlined in this red book, which you should also have in front of you.

Today, I would like to focus my remarks around four major lessons we have learned and how they may apply to the Federal Government's use of information technology, in particular the implementation of recent IT management reforms. I warn you that these lessons are not complex or technical or visionary. They are rather intuitive and very practical.

They are not about the technology itself, but the proven processes of managing and applying it. Just to give you an executive summary, these four are, first, improvement in managing technology is impossible without getting beyond the hyperbole to the real facts about what we are spending and what you are getting in return. In the Federal Government, much better information is needed about information technology investments, their size, their progress and the pay-off.

Second, information systems need to be treated as high risk, high-return efforts. Management control systems must be set up to focus limited resources on the highest value uses as well as identify and manage risks early on in the development process.

Third, repeatable success requires going beyond just plans and acquisition contracts to sound management best practices that are applied with relentless discipline. Federal agency executive teams solely on contractors. They must achieve indepth understanding of these best practices and take care to match the complexity of the projects they undertake with the information management capabilities they have developed.

Fourth, understanding these best practices is only a first step. The real challenge is implementation over several years to achieve tangible results. Agency management and oversight must make sustained coordinated efforts over a multiyear period to implement these and reinforce accountability to produce improved performance from IT investments.

Let me now just deal in somewhat more detail with each of these lessons in turn. The first lesson, get to the facts. Partly because of the rapid rate of change and intense competitiveness, a great deal

of hyperbole has become acceptable in the technology industry. There is a reason that Silicon Valley gave rise to the term, "vaporware" to describe promises of benefits that never materialized.

Most of the organizations we studied at one time or another neglected their steadily increasing expenditures on information technology and just treated them as a cost of doing business of a new era. However, usually, because of a budget cut or a competitive threat, as Mr. Huber referred to, that forced close reevaluation of these resource allocations. Their senior executives quickly learned to get beyond the promises in the midst of the facts, what exactly was being spent where, and what they were getting for their money.

In the Federal Government, we need to know more about IT investments. If you turn to page—exhibit 3 in the packet, what is known is that Federal IT obligations now total at least \$26 billion annually. However, this figure has limitations and may understate true spending by many billions. We know even less about what the public is getting for these expenditures.

Although there have been clearly—clearly been accomplishments in fields ranging from mission critical defense systems and space exploration to law enforcement and customer service, few Federal agencies can provide complete reliable information on the net return from their capital investments in IT. In the current budgetary environment this is an increasingly unacceptable situation.

The second lesson, IT investments offer high return, but also high risks. Senior managers in the leading organizations that we studied often learned the hard way through painful failures and wasted resources that the potentially big upsides of information systems come with equally painful downsides. Serious opportunities do exist in areas ranging from improved service, increased speed, reduced costs that we talked about this morning, and new choices for the public to safer more reliable information, but the risks are all too real ranging from complete failures to, as you mentioned this morning, Mr. Chairman, entrenching existing inefficient processes or as the industry likes to say paving cow paths.

If you turn to exhibit 4 in the package, an illustration of this comes from a recent survey of 365 public and private sector IT executives around the country, which produce the summary data shown in the chart in front of you. As you can see, these average figures for IT project failure rates are not encouraging. They show 16 percent average success rates, which means by their definition two specifications on time and on budget; over 50 percent cancellations before the end of the project, and approximately 30 percent, "problem projects" either over budget or late.

Given this experience, the simple conclusion of the executives we talked with is that this area wastes substantial amounts of their time and strong management controls both to make the best choices in the first place and to manage down risks. Organizations we studied with such controls were eventually able to achieve 85 percent success rates, a factor of 5 improvement over the average, which in itself is a good justification, I believe, for holding hearings like this to study IT best practices that are not average, but at the end of the curve.

In the Federal Government, the situation did not appear to be much different. If you turn to exhibit 5 in your packet, currently of the 18 agencies that represent 90 percent of recorded IT spending, half of them have major systems in the high risk list of either GSA, OMB or GAO. More senior involvement and better controls are needed to increase the abilities of Federal agencies to maximize return to the public and minimize risk.

The third lesson, sound information management practices, the only way to get repeated success project after project is to put in place a set of 11 integrated interdependent management processes, or best practices, as we call them. These stay relatively constant even amongst the rapidly changing technology choices and while not a silver bullet, are viewed by the people that we talked with as the major factor to their continuing success over time.

With them, the places we studied in periods from 2 to 5 years achieved significant improvements that we just went over. And perhaps most importantly, and this is actually very surprising to me in talking with these senior executives, the thing they emphasized was that the real benefit from improving their information management capability was they could take on more complex projects and pull off more difficult projects. The technology is getting more sophisticated with every new product cycle, constantly challenging organizations to keep their skills and abilities in line with a degree of difficulty in these things.

At this point, Mr. Chairman, I can briefly illustrate a select few of these practices in somewhat more detail and more concretely, but it is going to add a few minutes, or I can stay at a higher level. Which would you prefer?

Mr. HORN. Go ahead.

Mr. HOENIG. Go ahead?

Mr. HORN. Yes.

Mr. HOENIG. OK. Without going into too much detail—

Mr. HORN. Let me just say, we are not operating under the 5-minute rule this morning. We want to lay it all out.

Mr. HOENIG. OK. Great. Thank you.

Without going into too much detail, let me just illustrate 5 of these 11 practices somewhat more concretely. If you turn to exhibit 6, the practice here is recognizing and communicating the urgency to change information management practices, and we found in the leading organizations we studied benchmarking was the most typical way to do this. Compare yourself and how you are developing these systems to how other people are doing it.

In this particular chart, it shows how the organization started out, its performance are sort of the white bars on the left, and the industry standards are the dark bars on the right. They were taking twice as long and spending four times as much as the industry average to develop these information systems. That helped them spark the internal initiative to change the way they did business because they knew where they were wasting money, basically.

If you turn to exhibit 7, this is an example of a practice in terms of focusing on process improvement, the idea of analyzing the process first and then deciding how technology can help you improve it.

In this particular case, this organization, which actually is an insurer and has claims processing operations very similar to Federal agencies, like the Social Security Administration and VBA, was able, over a 7-year period, with 35 separate individual information systems investments, to go from 55 people in work steps down to one single point of contact and cut cycle time by a factor of 5.

If you turn to exhibit 8, another one of our practices involves anchoring strategic planning and customer needs and mission goals. What we found is that it is vital to take the time, even though it's blocking and tackling work, to take the time to carefully map the links between the use of technology and its ultimate impact.

In this example, as you can see, the organization had some key overall result areas that it had very specific quantitative metrics for. They had an objective to enhance customer service by a certain percentage, and then strategies which they ranked and prioritized here, as you can see, linked to critical success factors in the use of technology. So if you track down this chart through enhanced customer service to the middle strategy, enhancing response to the customer, that depended, for them, on two primary variables: Enhancing the system use, which involved training employees to use the system better, and improving the phone service by developing new software to route calls more effectively to the operators and make it easier to serve customers. The point is they mapped all of this out in advance generally, and then module-by-module put pieces in place and kept their eye on the ball.

Mr. HORN. Can I just interrupt at this point?

Mr. HOENIG. Sure.

Mr. HORN. This is one of the complaints that more people have told me about private industry, as well as Government, and that is that the voice mail system, with all the pressing of digits and numbers and so forth to run this decision tree to get the most finite possible answer you can get, has some real problems. One, people don't return the call. That is one. That is a human problem. It is also a technical problem. We ought to know somehow if they ever cleared that inquiry.

Do you have any words of wisdom on this? Is there a satisfaction survey that has been done of the customer, the taxpayer, the Social Security recipient?

I have tried their system and, you know, at the end of 7 minutes sitting there with the phone and looking at my wrist watch, you might get someone coming on the line. And have we looked at whether they need more resources, so forth? I just thought I would interject that at this point because that is one that I find flares go up with constituents and others.

Mr. HOENIG. It is. It is a very important issue and it is something the private sector has had a tough time tackling, but has had a lot of successes and it is not an easy fix as you can imagine. Companies that rely solely on the technology of voice mail to handle it all inevitably fail. The successful strategies that we saw were really a combination of factors.

One involved a lot of up-front communication with customers to make sure that people don't call in the first place, frequently unestimated. Second involves good technology in terms of routing. But a lot of the voice mail trees also make the mistake of not dis-

tinguishing between complex questions and simple questions. And one of the things we learned from the very advanced companies that we talked to on telephone customer service is that once you get that triage function in place and can separate the complex inquiries from the simple ones, then you have got people willing to wait a little bit longer for the complex questions. They understand that and you can put in different kinds of mechanisms to end the simple one.

This relates very effectively, I think, to your example of Social Security, because when they were rated No. 1 in customer service by this recent independent survey, the four marks out of six that they got positive marks on were basically in the quality with which they answered the question, but they kept people on the line over 20 minutes. So they have a long ways to go there. In that circumstance it can either be because you don't have enough people answering phones or because you haven't done the triage effectively up front.

Mr. HORN. Well, proceed. I didn't mean to interrupt you. But I thought I would get that off my chest in case I forgot about it.

Mr. HOENIG. All right.

In this next exhibit 9, one of the most compelling ones for us, and I think it remains probably the single most powerful in my own mind in terms of what the Federal Government needs to go to, managing IT projects as investments was one of our key practices. The key idea about an investment as opposed to expenditure is that you require a return in the form of some performance improvement.

As you can see in this example, in 1989 this organization decided to go in and ask the basic question: All of our people have promised us these millions of dollars in benefits from IT projects. What did we get? And they found they got 13 cents on the dollar, which is not a very satisfactory answer for them.

Three years later, after they put in place very rigorous investment control processes, they were getting on average \$1.33 for every dollar through a combination of more realistic estimation up front and better execution by line managers that were not accountable for delivering something and closing the loop rather than leaving it open ended to let the project's name change and become—basically take on a life of its own over multiple years.

So we found this is a particularly compelling practice that the private sector and leading organizations do well that we don't do very well in the Federal Government.

Finally, let me just illustrate with exhibit No. 10, another one of our practices is positioning a chief information officer not just as new management overhead or a scapegoat for IT problems, but as you can see in this case, a supplier to management line executives to help them make strategic decisions on IT investment, make decisions about technology standards and basically serve as a bridge to their colleagues to help them understand how to apply this technology to improve their business, a very critical function that we found.

In the Federal Government, just to step back up to the high level, we found few agencies that have implemented all 11 of these practices. Some still make the mistake of taking on huge complex

development efforts beyond their capability. We have actually developed an assessment tool, Mr. Chairman, which rates agencies on a scale of 1 to 4, where 4 equals the level we found in best practice organizations.

To date, we have found no agency that scores much beyond level 2 across the board. On the other hand, what is interesting about this is that some agencies are showing the ability to achieve higher scores in individual practice areas of these 11. Hence, there is a serious opportunity, I believe, for agencies to learn from one another to put together a complete package of these practices. And the foundation for improvement has now been laid. Recent legislation, which you referred to this morning, has thoroughly set expectations for Federal agencies to adopt all 11 of these practices.

Finishing up with the fourth lesson, the challenge being implementation. Understanding the need to put these new practices in place was only a small first step; 2 to 5 years to fully institutionalize the processes that we just talked about, we found. Similarly, in the Federal Government, while there is a real consensus that has emerged among Government decisionmakers on what problems are and what can be done to solve them, now we must effectively implement these processes to get some real results that are meaningful. And that is going to require at least three things.

The first thing is going to be going beyond an agreement on what to do to an understanding of how to do it. As a first step, we have developed numerous methods and tools for use by agencies in implementing practices required by the new law, but widespread training and organized learning is also going to be essential.

Second, it is going to be important to facilitate some success by concentrating on vital modernization efforts. Focusing oversight attention and resources on a limited number of high value efforts will increase the probability of producing a few fully modernized agency operations whose experience the rest of the Government can learn from.

And finally, to the oversight budget and appropriation process, all agencies must be required to produce performance base lines, report on all IT obligations at the project level, show promised versus actual results and establish a proven track record in managing and acquiring systems before undertaking large complex modernization efforts.

This subcommittee can play a vital role in implementation of these information management reforms by four basic roles: Providing implementation oversight similar to that which has been applied with the CFO Act. If experience is any guide, the first years will surface numerous thorny issues that you can help surface and resolve. Focusing attention on high risk IT projects such as your upcoming hearing on IRS tax system modernization can reinforce OMB accountability for risk management.

Concentrating on new especially critical systems development efforts early on that can prevent problems and reinforce capability before huge sums have been spent, such as your recent hearing on HCFA's Medicare transaction system, and finally highlighting the importance of governmentwide information technology issues ranging from information security and telecom to management information systems can help ensure that the legislative provisions are

successful in strengthening the integration of Federal systems and improving Federal information management capability.

Mr. Chairman, this concludes my statement. We look forward to working closely with you and the subcommittee in your effort to improve the public's return on their investment information technology, and we would be glad to answer any questions you or any other members of the subcommittee have at this time.

[The prepared statement of Mr. Hoenig follows:]

Statement of Christopher Hoenig
 Director, Information Resources Management
 Policies and Issues
 Accounting and Information Management Division

Mr. Chairman and Members of the Subcommittee:

It is a pleasure to be here this morning to discuss how best practices applied by leading organizations can be effectively used to improve the management of information technology (IT) in the federal government. A huge gap exists between public sector and private sector capabilities to use information technology to provide modern, efficient, and cost-effective services. Narrowing this gap is possible through improved legislation that requires agencies to adopt modern management practices and produce results. As you know, we have recommended IT management reforms for the last two years that are grounded in our past audit work and case study research conducted on leading public and private organizations.

Recently, we have helped to support significant revisions in laws and regulations, such as the Paperwork Reduction Act, OMB management circulars, and—just recently—the Information Technology Management Reform Act as amended to National Defense Authorization Act for Fiscal Year 1996. In some cases, these revisions represent the first significant changes made to IT-related legislation in over a decade. I might add, Mr. Chairman, that these accomplishments have only been possible with the interest, commitment for reform, and support from members of Congress who have pushed for greater accountability for public tax dollars.

In the near future as a result of these legislative changes and new direction from the Administration, agency leaders should begin making technology investment decisions based on careful analyses of relative costs, benefits, and risks. Consequently, Congress should be better informed of how technology expenditures are being used to address the pressing business problems of government agencies. More importantly, with an investment approach, IT projects should have a better chance of being initiated, continued, delayed, or cancelled on the basis of mission or operational performance improvements – the primary purpose of deploying information technology in the first place.

Much hard work lies ahead in implementing new management processes and making tough, informed decisions on how to best apply available IT to the government's pressing productivity, quality, and service delivery problems. Valuable lessons are plentiful about both successes and failures in the private and public sector that agencies can learn from.

Today, I would like to focus my remarks on four key lessons gleaned from our ongoing research and our evaluations of strategic information management issues in federal agencies:

- *First, better facts are needed about the government's IT investments.* What is known is that federal IT-related obligations now total at least \$25 billion annually. What is not known is what the government is specifically getting in return for these expenditures. Investment streams of this magnitude must be made carefully and with a full understanding of what the anticipated and actualized mission benefits are.

- *Second, IT is characterized by high risk and high return.* Real opportunities do exist to use it in ways that can boost organizational performance. But, risks of failure are ever present and must be rigorously managed in order to ensure successful decisions and project completions.
- *Third, repeatable success takes sound management processes that are applied with relentless discipline.* Our research on those organizations that implement IT projects successfully found that with rapidly changing technological power and choices, sustainable and effective management practices are the key to achieving regular success.
- *Fourth, the challenge is implementation.* Leading organizations found that understanding these practices was only a small first step. For most, it took three to five years to fully institutionalize the practices into improved management processes. Similarly, in the federal government, a consensus has emerged among government decision-makers on what the problems are and what can be done to solve them. Now, agency leaders must effectively *implement* more effective IT management processes and *reinforce* accountability to *produce* tangible results with IT investments.

I would like to elaborate on each of these points and then make some summary remarks.

Better Information Needed About IT Investments

In the current environment of making government work better and cost less, there are high expectations of information technology to change old, inefficient ways of running programs and delivering taxpayer services. Most federal agencies are largely dependent on information systems to deliver services, maintain operations, track outlays and costs, manage programs, and support program decisions. Technology offers government a means to revolutionize the way it interacts with citizens to streamline service, improve quality, and curtail unnecessary costs. Demonstrating these critical linkages to top government executives is paramount to achieving the necessary attention, understanding, and support necessary for long-term success.

Several facts are well known. The expectations for technology are set in a challenging federal environment. Increasingly, pressure is being brought to bear on shrinking the size of the federal deficit, not only by reducing spending but by getting better service for lower ongoing costs. IT-related obligations in the federal budget, exceeding \$25 billion annually, may be put under increasing scrutiny as part of overall discretionary spending.

Further, technology itself is evolving at a rapid pace. The industry reports on this issue are consistent. Every few years, the performance-to-price ratio of computer hardware doubles. New product cycles in the information technology industry now average

months rather than years. This rapid evolution produces new challenges—such as the security of global networks—before current problems can be fully resolved—such as the replacement of aging, legacy systems that can no longer meet requirements.

In this environment of demanding requirements, close scrutiny, and rapid change, more attention needs to be focused on what is not known about the government's technology investments. First, the government really does not know exactly how much it is spending on IT. The \$25 billion figure represents specific IT obligations reported to OMB by federal agencies through a special budget exhibit.¹ This information is not comprehensive or collected on a governmentwide basis; therefore, the total amount of annual spending for IT is unknown.²

For example, agencies are not required to report IT obligations under \$50 million. The legislative and judicial branches of government are not required to report IT obligation data to OMB. Additionally, IT obligations embedded in weapon systems and federally funded research on computers are also not part of the reporting requirement. If included, these figures could significantly alter the size of the governmentwide IT investment portfolio. The Department of Defense, for example, has estimated it spends \$24 billion to \$32 billion annually for software embedded in weapon systems.

Second, most agencies do not capture or maintain reliable information on projected versus actual costs and benefits of IT investments. Without this type of information, it is virtually impossible to construct a return on investment calculation as a way of demonstrating positive net gains in cost reductions, improvements in quality, and reduced cycle time for service delivery.

Technology Projects Offer Potential For High Returns, But Include Significant Risks and Uncertainties

The promise of new information technologies is compelling in the federal environment where aging systems prevail that are often ill-designed for changing business or mission requirements. There are inherent risks associated with not acting to address these technology deficiencies, including potential operational disruptions to vital government

¹OMB Circular A-11, Section 43.

²Information Technology Investment: A Governmentwide Overview (GAO/AIMD-95-208, July 1995). For the most part, agencies do not break out IT obligations as separate line items in their budget documents, but rather include this information within program or administrative costs. The exception may be in the case of major modernization efforts that rely heavily on information systems, but this too can vary from one agency to the next.

services such as air traffic control, income tax collection, and benefit payments to recipients of health care or social security.

The opportunities for using technology to improve cost effectiveness and service delivery in government are immense. While the return of these investments are not yet proven, examples of how technology can be a powerful tool include:

- *reducing public burden*, such as IRS' Telefile project that allows taxpayers to file 1040EZ tax returns via touch-tone phones;
- *reducing operating costs*, such as data center and telecommunications consolidation projects being conducted by the Department of Defense and now OMB on a governmentwide basis, as well as post-FTS 2000 implementation, and governmentwide E-mail;
- *creating choices and alternatives for the delivery of government services*, such as electronic benefit transfer payments, information Kiosks, agency home pages on the Internet, and electronic data interchange between government vendors and agencies;
- *increasing the responsiveness and timeliness of services*, such as the Social Security's highly rated telephone customer service program.
- *improving the value and impact of government information*, such as the international trade and environmental data index projects being conducted under the auspices of the National Performance Review; and
- *increasing the integrity and reliability of government information systems*, such as reducing health care fraud through better software detection methods and enhancing the security of federal data through implementation of better internal controls.

But there are also risks associated with taking action to implement new information systems. Our reviews of major modernization efforts have shown that the introduction of newer, faster, cheaper technology is not a panacea for flawed management practices or poorly designed business processes. Business needs must dictate the requirements and justification for the type of technology to be used.

To ensure this occurs, program units in agencies must carefully analyze the processes or procedures that are being modernized. When processes are reengineered in concert with the power of information technology, significant results can be achieved. Let me illustrate with a few select examples from both the public and private sector.

- *Liberty Mutual reports that cycle time for the issuance of insurance policies averaged 62 days, even though the actual determination time took less than 3 days. Upon close inspection, management discovered inherent process and*

support inefficiencies, such as up to 24 different handoffs of the policy paperwork, separate appeals processes for both sales and underwriting, and separate computer systems for each department. By combining process redesign with a more powerful, integrated information system, Liberty was able to reduce cycle times by one-half, eliminated virtually all policy handoffs, and was able to significantly reduce appeals to policy denials.

- IBM Credit Corporation reports that the process to approve credit for IBM customers of computers, software, and services was redesigned from five steps and an average cycle time of seven days to a one-person, four hour process -- a 90 percent improvement in cycle time and hundredfold improvement in productivity. Again, better designed and integrated information systems were part of the total solution.
- Eastman Chemical found that maintenance staff were spending as much as 50 percent of their time finding and ordering equipment parts. By combining process redesign with a computerized maintenance information system, Eastman Chemical reports it was able to cut by 80 percent the time needed to find and order materials. As a result, maintenance productivity has risen sharply and the company is saving more than \$1 million every year in duplicate inventory costs.
- The Department of Interior's Bureau of Reclamation has concluded that mission rescoping has resulted in a focus on water resources management rather than building large public works projects. The Bureau reports that reengineering and better use of technology has resulted in a grants approval process being reduced from 15 steps over 6 months to 5 steps and one week. Similarly, fish ladder design and funding approval processes have been streamlined from 21 steps taking over 3 years to eight steps taking just 6 months.

Nonetheless, just as technology can help produce impressive success stories, it can also become the focus of costly business failures. Dramatic, captured results can be few and far between. A recent research study conducted by The Standish Group on private and public sector organizations in the United States confirms this troubling trend.³ According to the research, IT executives report that one-third of all systems development projects are cancelled before they are ever completed. This statistic highlights the reality of the complexity in planning, designing, and managing successful IT projects.

IT executives participating in the Standish Group research also reported that only 16 percent of all IT projects were considered successful—that is, judged to have

³Charting the Seas of Information Technology Chaos, The Standish Group International, 1994.

accomplished what was expected within the budget anticipated at the outset. In addition, of those IT projects that are completed, only about 42 percent of the largest companies are successful in meeting their initial objectives. In addition, the study's participants reported that over 50 percent of IT projects exceed their original cost estimates by almost 200 percent. These statistics serve as a stark reminder that information systems projects carry high risks of failure if not carefully managed and controlled.

Although no comparable data is available that focuses exclusively on the federal government, our work on specific systems projects has found a cascade of problems—ranging from poorly defined requirements, poor contractor oversight, and inadequate system design to managerial and technical skill deficiencies—have led to project terminations, delays, or suspensions of procurement authority.⁴

In addition, three agencies with oversight responsibility—GAO, OMB, and GSA—have identified problems that selected systems development efforts or IT operations are having. Each agency has constructed a corresponding "high-risk" list to help focus top management attention on the problems and implement effective remedial actions. Of the 18 agencies and departments representing over 90 percent of total federal spending on information management and technology, nine have IT projects or areas of IT management on one or more of these high risk lists. Table 1 lists the eleven agencies and projects that are currently on high risk lists.

⁴Government Reform: Using Reengineering and Technology to Improve Government Performance (GAO/T-OCG-95-2, Feb. 2, 1995); Improving Government Actions Needed to Sustain and Enhance Management Reforms (GAO/T-OCG-94-1, Jan. 27, 1994); Information Resources: Summary of Federal Agencies' Information Resources Management Problems (GAO/IMTEC-92-13FS, Feb. 13, 1992).

Table 1: IT Areas and Systems at Risk

Agency/IT Project	GAO High Risk Series	OMB High Risk List	GSA Time Out Program ^a
Federal Aviation Administration: Air Traffic Control Modernization/Advanced Automation System	✓	✓	✓
Internal Revenue Service: Tax systems Modernization	✓		
Department of Defense: Corporate Information System	✓		
National Weather Service Modernization	✓	✓	✓
Department of Agriculture: Info Share Project	*	✓	✓
Department of Justice: Information Systems Security	*	✓	
Department of State: IT Operations and Security	*	✓	
GSA: Oversight of Major Systems Development Efforts Within GSA	*	✓	
Securities and Exchange Commission: Management of Systems Development Projects	*	✓	
Veterans Benefits Administration: Claims Modernization	*		✓
Patent and Trademark Office Modernization	*		✓

^aGSA has also conducted information resource management reviews that have touched on several of these agencies and programs.

*Note: Though not designated as high risk, GAO has issued reports related to these efforts.

GAO has testified regularly on the urgent need for basic management reforms in the federal government.⁵ Systems development efforts often fail due to inadequate

⁵Improving Government: Actions Needed to Sustain and Enhance Management Reforms (GAO/T-OCG-94-1, Jan. 27, 1994), Government Reform: Using Reengineering and Technology to Improve Government Performance (GAO/T-OCG-95-2, Feb. 2, 1995), Government Reform: Goal-Setting and Performance (GAO/AIMD/GGD-95-13OR, Mar. 27, 1995), Managing For Results: Steps For Strengthening Federal Management (GAO/T-GGD/AIMD-95-158, May 9, 1995), Managing For Results: Critical Actions for Measuring Performance (GAO/T-GGD/AIMD-95-187, June 20, 1995), Government Reform: Legislation Would Strengthen Federal Management of Information and Technology (GAO/T-AIMD-95-205, July 25, 1995).

management attention and controls. Despite the visibility and oversight focus on many large systems development efforts, agency management has often been ineffective in reducing the risks associated with large, multi-year projects. For example, in our July 1995 review of IRS' Tax System Modernization, we found an absence of effective information management practices—such as IT investment selection, control, and evaluation processes—which were placing selected modernization projects at risk of failing to meet critical business needs.⁶ The absence of these practices places executive level understanding and support of the technology project in jeopardy and reduces accountability for project success.

Inadequate project management, poor contractor oversight, and a shortage of staff with appropriate technical skills have also contributed greatly to systems development problems. After investing over 12 years and more than \$2.5 billion, the Federal Aviation Administration (FAA) chose to cut its losses in its problem-plagued \$6-billion Advanced Automation System (AAS) by either cancelling or extensively restructuring elements of this effort to modernize our nation's air traffic control system. Our work showed that AAS' problems were attributable to FAA's failure to (1) accurately estimate the technical complexity and resource requirements for the effort, (2) stabilize system requirements, and (3) adequately oversee contractor activities.⁷

We are also finding that agencies have not instituted a well-defined investment control process to manage the quality of systems development efforts and monitor progress and problems at an executive level. Our recent analysis of the potential risks associated with the Health Care Financing Administration's (HCFA) Medicare Transaction System (MTS) illustrates this problem. MTS, though small in comparison to larger modernization efforts in other agencies, is one of the most critical new claims-processing systems being put into government today. When the system becomes operational in 1999, HCFA expects it to process over 1 billion claims annually and be responsible for paying \$288 billion in benefits *per year*. Although MTS is in its early development stages, our work last November found that HCFA is experiencing a series of problems related to requirements definition, project schedule, and project cost. Some of these are classic symptoms associated with the fate of other large, complex systems projects—extensive delays and schedule compression early in the project along with ill-defined systems requirements and objectives.

⁶Tax Systems Modernization: Management and Technical Weaknesses Must Be Corrected If Modernization is To Succeed (GAO/AIMD-95-156, July 26, 1995).

⁷Advanced Automation System: Implications of Problems and Recent Changes (GAO/T-RCED-94-188, Apr. 13, 1994).

Consistently Applying Management Practices is Important to Success

It is important that federal executives learn from leading organizations that *have* been successful in applying and managing technology to thorny business problems as well as opportunities for change. To help federal agencies improve their chances of success, we completed a study of how successful private and public organizations designed and implemented information systems that significantly improved their ability to carry out their missions. Our report describes an integrated set of fundamental management practices that are instrumental in producing success.⁸ The active involvement of senior managers, focusing on minimizing project risks and maximizing return on investment, are essential. To accomplish these objectives, senior managers in successful organizations consistently follow these practices to ensure that they receive information needed to make timely and appropriate decisions.

Executives in leading organizations manage through three fundamental areas of practices. First, *they decide to work differently* by quantitatively assessing performance against leading organizations and recognizing that program managers and stakeholders need to be held accountable for using information technology well. Second, *they direct their scarce resources toward high-value uses* by reengineering critical functions and carefully controlling and evaluating IT spending through specific performance and cost measures. Third, *they support major cost reduction and service improvement efforts with the up-to-date professional skills* and organizational roles and responsibilities required to do the job. Table 2 illustrates the set of management practices we found in the leading organizations we studied.

⁸Executive Guide: Improving Mission Performance Through Strategic Information Management and Technology—Learning From Leading Organizations (GAO/AIMD-94-115, May 1994).

Table 2: Strategic Information Management Best Practices

DECIDE TO CHANGE	DIRECT CHANGE	SUPPORT CHANGE
1 Recognize and communicate the urgency to change IT practices	4 Anchor strategic planning in customers needs and mission goals	9 Establish customer/supplier relationships between line and information management professionals
2 Get line management involved and create ownership	5 Measure the performance of key mission delivery processes	10 Position a Chief Information Officer as a senior management partner
3 Take action and maintain momentum	6 Focus on process improvement in the context of an architecture	11 Upgrade skills and knowledge of line and information management professionals
	7 Manage IT projects as investments	
	8 Integrate the planning, budgeting, and evaluation processes	

The power and the attraction of these practices is that they are intuitive and straightforward. And when used, they can help produce repeatable success. Some of our case study organizations experienced dramatic improvements, such as

- the proportion of IT projects completed on-time, within budget, and according to specified requirements going from 50 percent to 85 percent in two years,
- a 158 percent increase in workload being handled with the same level of staffing because of redesigned processes and modern, integrated information systems, and
- a 14-fold increase in benefits returned from information systems projects--from 9 percent of that projected to 133 percent of that projected.

But, as experience shows us, the challenge lies in the discipline and rigor with which they are consistently applied by organizations.

Rather than discuss each practice individually, let me focus on a few key ones and highlight their importance in the context of an overall strategic management framework.

Involvement and Commitment From Top Leadership

In the information age, top executives have the responsibility not only to define business goals, but also to initiate, mandate, and facilitate major changes in information management to support the achievement of these goals. Top executives must get personally involved in understanding the relative costs, benefits, risks, and returns associated with information technology investments they are making decisions about and allocating resources to. Unless top executives make these linkages, meaningful change can be slow and sometimes impossible.

Driven by budget constraints, one chief executive in our case study sample benchmarked existing systems development capabilities against industry standards. The CEO discovered that the company was getting only a small fraction of expected benefits from systems investments, while taking twice as long and spending four times the resources compared to an industry standard. To correct this, the CEO fostered partnerships between business unit managers and IT professionals that focused on building information systems with measurable benefits. Within 3 years, some tangible payoffs from this approach were occurring. Returns on IT investments rose from \$2 million to \$20 million per year, applications development and productivity improvements increased steadily, and staff resources were moved from maintaining existing computer applications to more strategic reengineering development and support.

Focusing on Improving Business Processes

New technology alone will not improve performance or solve operational problems. It is merely a tool--albeit a powerful one--that supports work processes and the decisions surrounding those processes. If the work processes are inherently inefficient, then technology will not have substantive impact. Accomplishing dramatic improvements in performance usually requires streamlining or fundamentally redesigning existing work processes. Information technology projects must then become focused on improving the way work is done rather than simply automating existing, outmoded processes. As we have seen in the federal government, initiating information systems development projects to replace old

technology or automate processes in and of itself is often a poor project justification.⁹

In one company we examined, long customer waits and unacceptable error and rework rates were threatening successful business growth. Business unit executives and information technology professionals worked together to redesign existing work processes and systems. As a result, a customer process that used to involve 55 people, 55 procedural steps, and a 14-day service delivery was reduced to one person, one phone call, and one step with a 3-day service delivery.

Applying technology to new business processes cannot be done in an organizational vacuum. It requires careful consideration of the technical platform, or architecture, of the information systems. If several process improvement efforts are pursued in an unintegrated fashion, they may result in the creation of many new information systems that are isolated from each other. Such fragmentation can seriously inhibit the organization's ability to share information assets or leverage the benefits of new technology across the organization. The importance of developing and managing an integrated information architecture is one reason why sound strategic information planning is so critical.

Establishing a Strategic Information Management Process

Strategic planning often is depicted as "visionary" thinking or "where we want to go, whether we can get there or not." In the federal government, strategic management at the enterprise level is often a well-orchestrated paper chase responding to bureaucratic requirements and short-term crises, rather than an integrated, institutionalized process that focuses on producing results for the public. Conversely, in the leading organizations we visited, strategic business and information systems plans were always grounded in explicit, high-priority customer needs. Planning, budgeting, program execution, and evaluation are conducted in a seamless fashion, with the outputs of one process a direct input into the other. Most importantly, strategic goals, objectives, and direction are used to actually manage and evaluate the performance of the organization.

In one state revenue collection agency we examined, they decided to use the external customer--the taxpayer--as the focus for rethinking and redesigning its

⁹USDA Restructuring: Refocus Info Share Program on Business Processes Rather Than Technology (GAO/AIMD-94-156, Aug. 5, 1994), Social Security Administration: Major Changes in SSA's Business Processes Are Imperative (GAO/T-AIMD-94-106, Apr. 14, 1994), Veterans Benefits Administration: Further Service Improvement Depends on Coordinated Approach (GAO/T-AIMD/HEHS-95-184, June 22, 1995), Business Process Reengineering: DOD Has A Significant Opportunity to Reduce Travel Costs By Using Industry Practices (GAO/T-AIMD-95-101, Mar. 28, 1995).

services. Using customer focus groups, comprised of individual taxpayers, small businesses, and large corporations, they redesigned the revenue collection process. Information systems and technology were used to maintain customer profiles to assist the agency in responding to questions, problems, and special situations for each taxpayer.

Linking Technology Investment to Performance Measurement

Getting the most out of scarce resources available to spend on IT is another key to success. Executives expect meaningful bottom-line improvements in the outcomes of key business process changes and applications of information systems and related technologies. For this reason, leading organizations carefully measure the performance of their processes, including the contribution that technology makes to their improvement. Senior management is personally involved in project selection, control, and evaluation and uses explicit decision criteria for assessing the mission benefits, risks, and costs of each project.

One leading organization we studied uses a "portfolio" investment process--based on decision criteria for assessing costs, benefits, and risks--to select, control, and evaluate information systems projects. As a consequence of more carefully scrutinizing proposed benefits and measuring actual performance results, the company realized a 14-fold increase in the return on investment from IT projects within 3 years.

The key to this investment approach is the ability to identify early--and avoid--investments in projects with low potential to provide improvements in program outcomes. Without this focus, organizations can easily become entangled in a web of difficult problems, such as unmanaged development risks, low-value or redundant IT projects, and an overemphasis on maintaining old systems at the expense of using technology to redesign outmoded work processes.

Establishing an Executive Level Focus for Information Management

Leading organizations have found that one important means for establishing a clear organizational focus for information management is to position a Chief Information Officer (CIO) as a senior partner with the organization's top executives. The position itself is not the solution. What matters is the influence that the right person can bring to bear on strategic management issues and IT's role in both helping resolve existing performance problems and capturing potential from new opportunities. An effective CIO should:

- serve as a bridge between top executives, line management, support staff, and IT professionals,

- advise top executives and senior managers on the worthiness of major technology decisions and investments,
- work with managers to understand and define the role of IT in helping achieve expected business or program outcomes, creating a joint partnership with line management to achieve successful project outcomes,
- design and manage the system architecture supporting the business needs and decision-making processes of the organization, and
- set and enforce appropriate technical standards to facilitate the effective use of information resources throughout the entire organization.

In one of our case study organizations, prior to establishing a CIO, the cost of maintaining and enhancing existing systems consumed nearly all the organization's IT budget. There was no one to focus senior management attention on critical information management and technology decisions. Once an experienced CIO was put in place, technology investment decisions became highly visible and line executives were held accountable for the business case underlying these decisions. The CIO focused on improving the speed, productivity, and quality of IT products and services.

A key CIO responsibility is to promote a productive relationship between the users of technology and the information management and systems staff who support them. Managers in leading organizations recognize that they are customers of IT products and services. They assert control over the funding of IT projects and take responsibility for understanding and helping to define the technology needed to support their work. The IT professionals then act as suppliers, working to support efforts to meet clearly defined management objectives, make critical decisions, and solve business problems. This requires facilitation, mediation, balance, and consensus--particularly when weighing the needs of individual business units with the corporate needs of the organization. The CIO can help make this process work smoothly.

If the management focus of leading organizations who are successful at applying technology to business needs and problems are compared with typical management practices found in federal departments and agencies, major differences appear. Table 3 summarizes some of the primary discrepancies.

Table 3: Management Approaches in Leading Organizations Versus Typical Federal Agencies

Best Practice Management Area	What a Leading Organization Does	What a Typical Federal Agency Does
Decide to change <i>Initiate, mandate and facilitate major changes in information management to improve organizational performance</i>	<ul style="list-style-type: none"> ✓ Quantitatively benchmarks against standards and industry leaders ✓ Evaluates current performance and opportunities for improvement ✓ Holds program managers and stakeholders accountable for IT decisions 	<ul style="list-style-type: none"> • Fails to benchmark performance • Delegates IT issues to technical units and staff • Sustains management rates of turnover that hinder true ownership and accountability
Direct change <i>Establish an outcome-oriented, integrated strategic information management process</i>	<ul style="list-style-type: none"> ✓ Evaluates existing mission critical processes before applying IT ✓ Directs scarce IT resources towards high-value, high priority uses ✓ Carefully controls and evaluates IT spending through specific cost and performance measures 	<ul style="list-style-type: none"> • Often justifies or purchases IT products and services before evaluating existing business processes • Lacks accountability and disciplined decision-making for IT investments • Fails to rigorously monitor the results produced by systems investments
Support change <i>Build organizationwide information management capabilities to address mission needs</i>	<ul style="list-style-type: none"> ✓ Maintains up-to-date professional skills in technology management ✓ Establishes clearly defined line and IT management roles and responsibilities 	<ul style="list-style-type: none"> • Perpetuates outmoded skill base with inadequate training and hiring of new expertise • Fails to delineate line management and IT professional roles and responsibilities in major system development and modernization efforts

Implementation of Governmentwide IT Reforms

Congress has provided clear direction to move the debate from *whether* to change information management practices in the government to *what* exactly to change and *how* to do it. Significant changes in law have already occurred that represent major, positive steps forward in pushing for greater top management responsibility and accountability for successful IT outcomes and provide the impetus for improvements in agency management approaches.

Last year, the Paperwork Reduction Act was revised to include many of the fundamental management practices endorsed by our research. For example, strategic IT planning provisions explicitly call for linkages between agency business plans and IT projects. This strategic planning is to be anchored in customer needs and mission goals. Moreover, the agency head is now directly responsible for ensuring that IT-related activities directly support the mission of the agency. Additionally, IT projects are to be managed as investments, with a process put in place to maximize the value and assess and manage the risks of major IT initiatives.

In addition, OMB has revised its Circular A-130--the primary governmentwide policy guidance for strategic information management planning--to require agencies to (1) improve the effectiveness and efficiency of government programs through work process redesign and appropriate application of information technology, (2) conduct benefit-cost analyses to support ongoing management oversight processes that maximize return on investment, and (3) conduct post-implementation systems reviews to validate estimated benefits and costs.

Most notable is the Information Technology Management Reform Act of 1996 that has been passed as an amendment to the Fiscal Year 1996 DOD Authorization Act.¹⁰ Not only does this legislation effectively build upon management and strategic planning themes in the Government Performance and Results Act and the Paperwork Reduction Act, it also contains some of the most significant changes made to IT planning, management, and procurement in decades. Agencies are required to use capital planning and investment processes for reaching decisions about IT spending, rigorously measure performance outcomes of IT projects, and appoint Chief Information Officers to ensure better accountability for technology investments. In addition, the procurement process has been streamlined to allow agencies more flexibility in buying commercially available products and awarding contracts. Collectively, these changes in law and regulation should make it clear to agency leaders what the Congress and the Administration intend to be done differently in investing and managing information and technology.

¹⁰National Defense Authorization Act for Fiscal Year 1996, Public Law 104-106, Division E.

Just as important as the "what to do" is the "how to make it happen." Agency managers need new methods and tools that will help facilitate fact-based discussions and analyses of proposed IT investments. Toward this end, we have developed a strategic information management assessment guide used in five agencies and departments to date--Housing and Urban Development, Coast Guard, IRS, Pension Benefit Guaranty Corporation, and the Bureau of Economic Analysis.¹¹ This analysis has been used to identify management strengths and weaknesses and to construct corrective action plans. Several of these agencies have reported that the implementation of new management processes in concert with our best practices framework has helped save several millions of dollars by consolidating systems with business function redundancies, and cancelling questionable low-value IT investments. Other agencies have conducted self-assessments on their own, and we are in the process of obtaining feedback on their results.

OMB has also published an IT investment analysis guide¹², which provides agencies with a structured management process for reaching decisions about selecting, controlling, and evaluating IT investment projects. Finally, we are developing more detailed management assessment guides for business process reengineering and IT performance measurement which we expect to distribute in the near future.

Concluding Remarks

Mr. Chairman, two key factors will inevitably affect changes to the government's approach to information technology management. First, *government leaders must facilitate success*. Never before has there been such a sense of urgency to improve how the government is managing and acquiring its information and technology assets. Where possible, success stories both inside and outside of the federal government must be shared and senior agency managers must learn from them.

The second key factor affecting long-term improvement to IT management in government is *reinforcing accountability for results*. In this regard, focused and consistent direction, advice, and oversight is needed from the Congress, the Executive Branch, and central oversight agencies. It is essential that the federal government's IT portfolio be visibly monitored in the oversight process. Agencies should be required to produce performance baselines, report on all IT obligations and expenses,

¹¹Strategic Information Management (SIM) Self-Assessment Toolkit, Exposure Draft, Version 1.0, U.S. General Accounting Office, Accounting and Information Management Division, October 28, 1994.

¹²Evaluating Information Technology Investments: A Practical Guide, Office of Management and Budget, Executive Office of the President (OMB Publication 041-001-00460-2, November 1995).

show projected versus actual project results, and establish a proven track record in managing and acquiring systems technologies. Oversight flexibility should be increasingly earned as demonstrated capability to deliver increases.

With proper incentives and encouragement, agency managers can be expected to surface problems early and move towards management resolution before huge sums of money are expended. Budget and appropriations decisions as well as oversight hearings can focus on anticipated risks and returns of IT projects, interim performance results, and final evaluations of long-term improvements to program outcomes, service delivery, and cost effectiveness.

This Subcommittee can play an important role in promoting new, effective management practices throughout the government by:

- providing oversight and guidance to federal agencies in implementing the IT-management related provisions of the Paperwork Reduction Act and the Information Technology Management Reform Act--similar to the very effective role you have played in overseeing the implementation of the Chief Financial Officers Act;
- focusing oversight attention on high risk IT projects and initiatives, such as your upcoming hearing planned on IRS's financial management reforms and Tax System Modernization project;
- identifying and focusing agency attention on new systems development efforts that are demonstrating signs of managerial or technical problems early in their life cycle before huge sums of money have been spent, such as your recent hearing on HCFA's Medicare Transaction System; and
- highlighting the importance of emerging information technologies and management techniques that can be effectively applied to the federal government.

Mr. Chairman, this concludes my prepared testimony. We look forward to working with you and the Subcommittee in your efforts to improve the public's return on investment in information technology. I would be glad to answer any questions you or other members of the Subcommittee may have at this time.



Information Technology Best Practices

House Subcommittee on
Government Management,
Information and Technology

February 26, 1996

Exhibit 1: Leading Organizations

Private sector	State government
American Airlines	California (BOE)
Kodak	Florida (DOI)
Royal Bank of Canada	Minnesota (DOR)
Xerox	Oregon (DOT)
United Services	Texas (RCT)
Automobile Association	

Exhibit 2: Long-term Results

2 - 5
Years

Increased Productivity

158% increase in workload handled with the same staff levels; measurable productivity increase (5.9% annual rate) & higher quality

Improved Customer Service

of employees responding to customer inquiries reduced from 16 to 1; number of systems supporting the process cut from 70 to 1

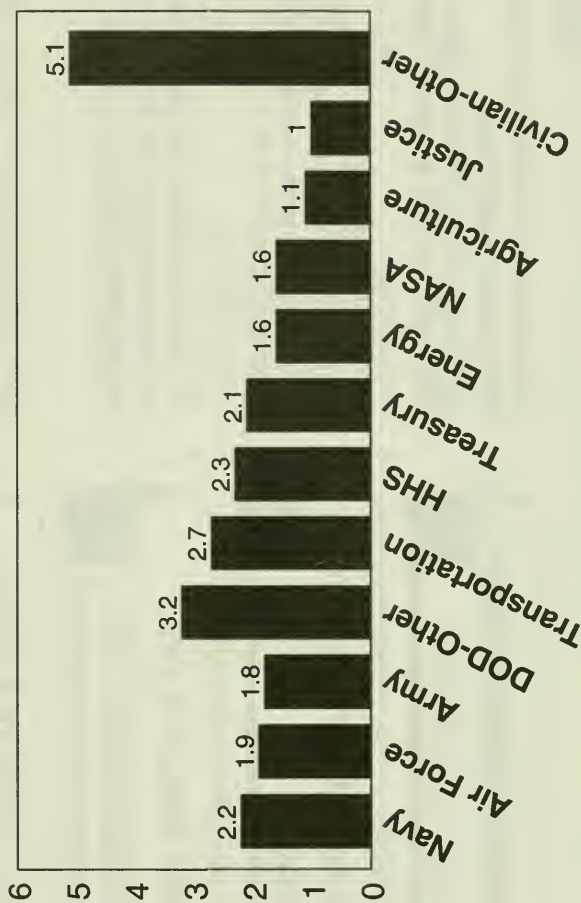
Higher Returns on IT Investments

In 3 years, realized benefits from IT projects went from just 9% of that projected to 133%

Lower Risks of Failure, Delays, Overspending

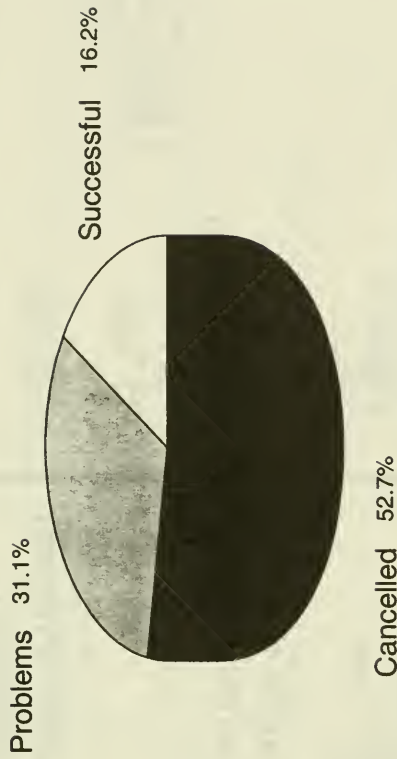
From 50% to 85% completion rate of IT projects on time, within budget, at acceptable risk levels, with examples of improvements in IT returns

Exhibit 3: FY 1996 \$26 Billion IT Obligations



Source: Office of Management and Budget

Exhibit 4: High IT Failure Rates Are Common



Source: The Standish Group International

Exhibit 5: High Risk Programs

OMB High Risk List

USDA Info Share
NWS
DOJ Computer Security
State Department IRM
FAA AAS
SEC

GSA "Time Out" Program

PTO Modernization
USDA Info Share
NOAA AWIPS
FAA AAS
VBA Modernization

GAO High Risk IT Projects

FAA ATC
Modernization
IRS TSM
DOD CIM
NWS Modernization



Exhibit 6: Benchmarking

One case study organization's systems development status against a benchmark provided tangible evidence to convince top management of the need for change.

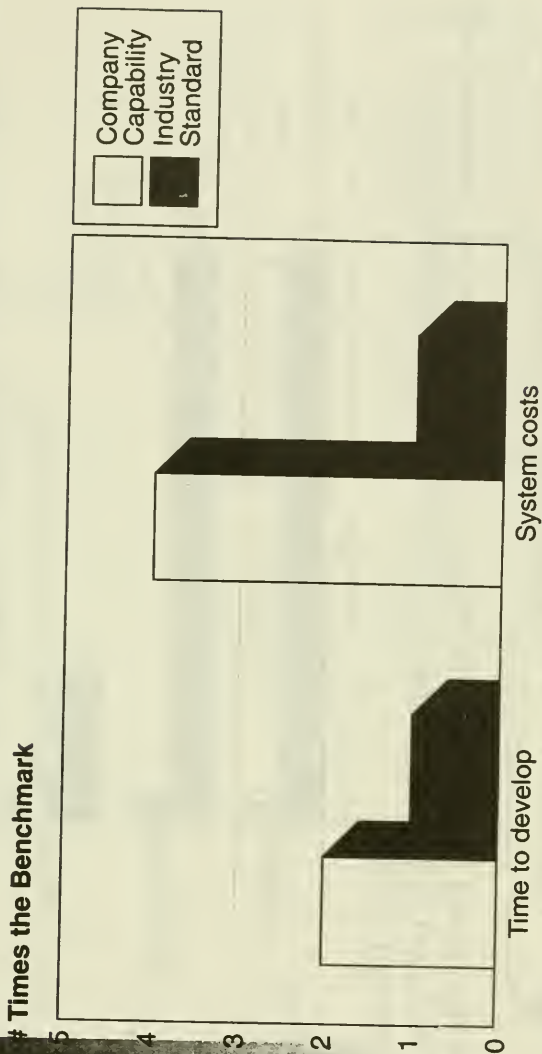


Exhibit 7: Process Improvement

Incorporating information technology into reengineered processes led to reduced data redundancies, sped service to customers, and improved quality.

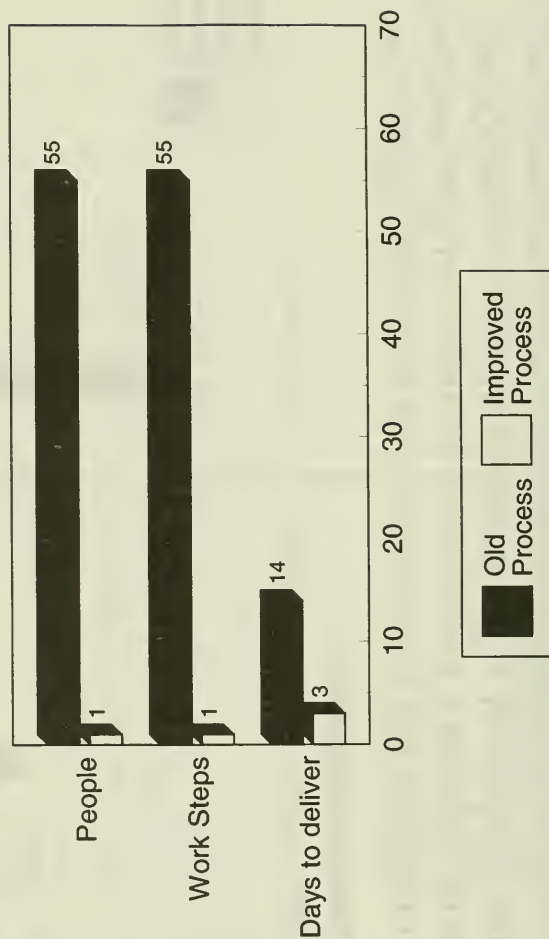


Exhibit 8: Strategic IT Planning

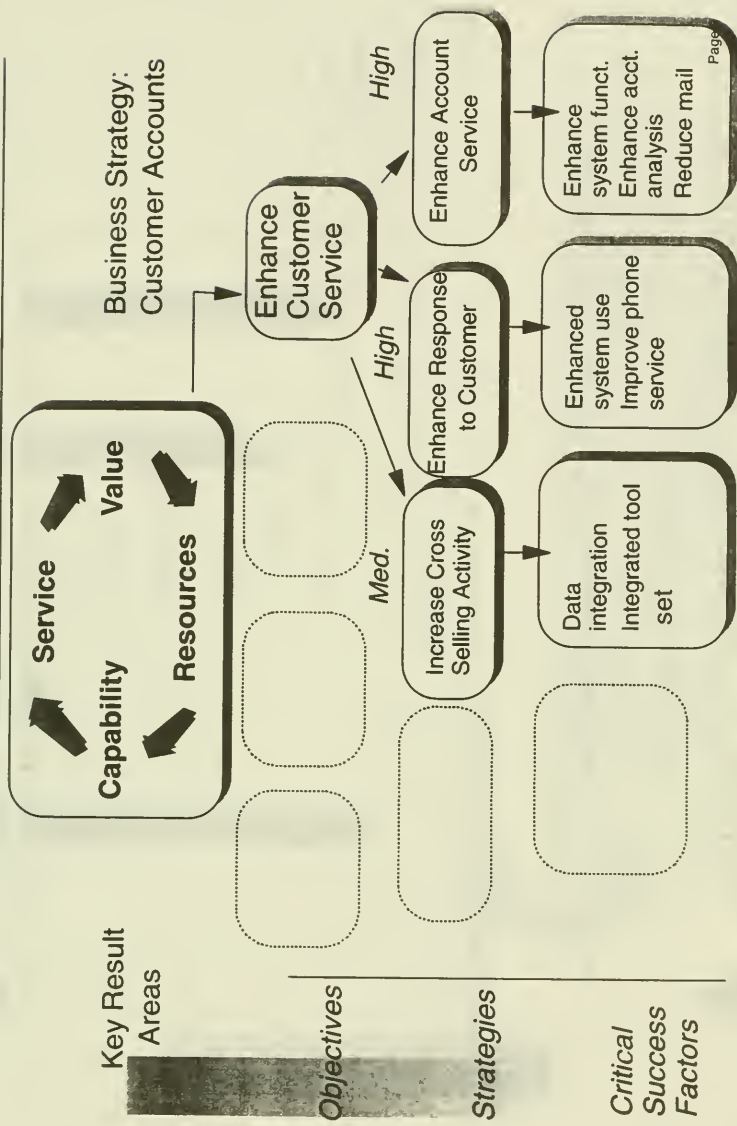


Exhibit 9: Investment Management

More realistic estimates of benefits; actual benefits rose from 9% of that projected to 133%

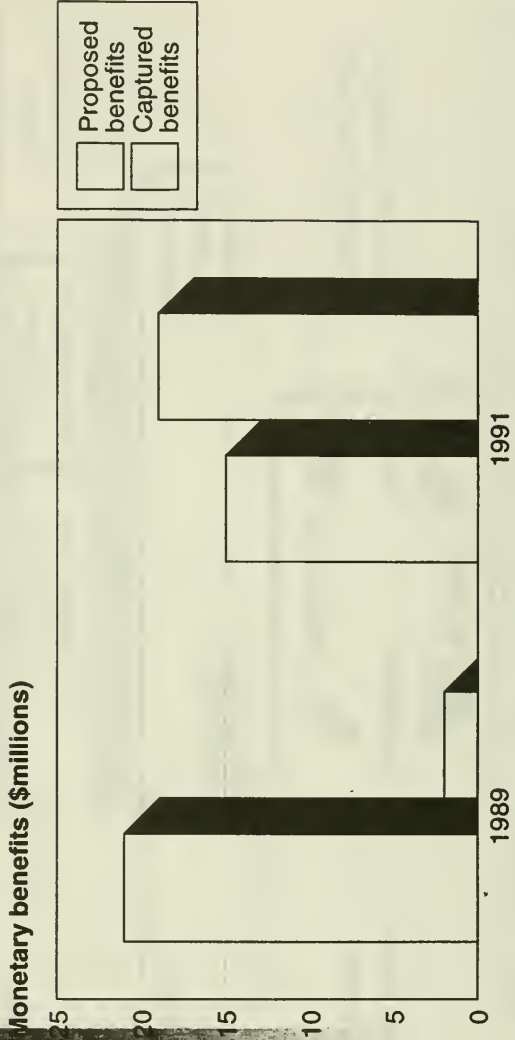
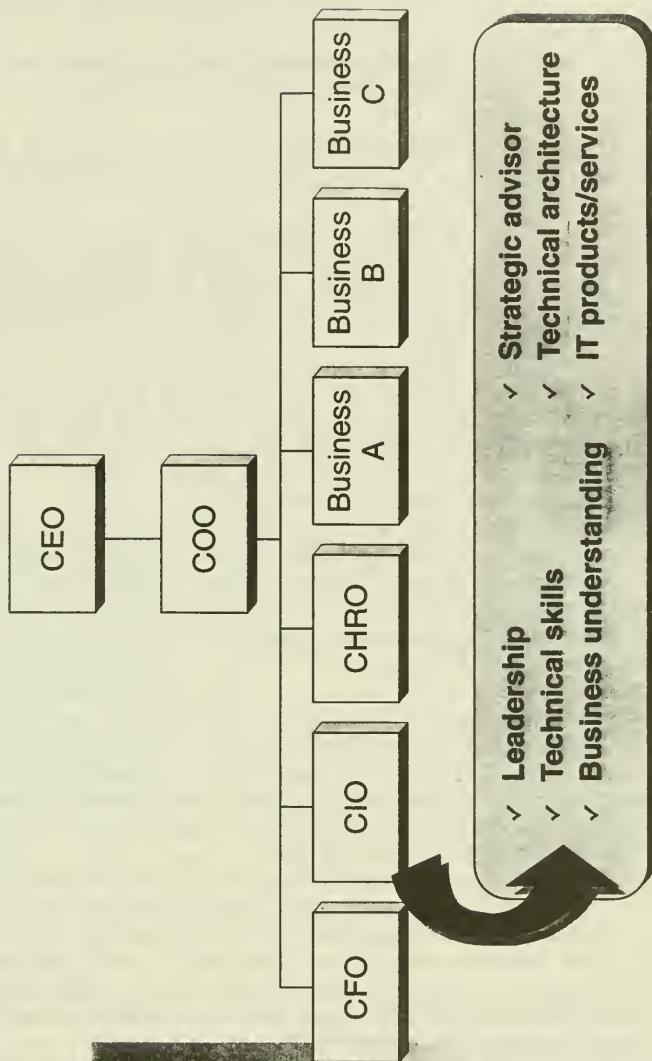


Exhibit 10: Chief Information Officer



Mr. HORN. Well, I thank you very much for the excellent presentation which both you and your colleague, Dr. McClure, have prepared.

Let me ask the ranking minority member, Mr. Peterson, if he has any questions on this at this point.

Mr. PETERSON. No.

Mr. HORN. The gentleman from Florida was here a minute ago. When he comes back, we will get him into it, because he asks excellent questions.

Let me go through some of this. Let me start with a crazy little example that affects my daily life. I did not mention, when our first witness spoke, that—or stressed that he would recommend the abolition of the Government Printing Office. Since that is part of the legislative branch, as GAO is part of the legislative branch, obviously a great tingle went up and down my spine.

One of the great things the Government Printing Office does is prepare the Congressional Record everyday. It is one of the great miracles of American publishing that on your desk the next morning is a 700-page document, blow by blow of what the other body has done as well as what this body has done.

Now, one way you can access that is obviously through a very facilitative index, and in the case of the Congressional Record the index does not come until several weeks later. And we no longer publish the permanent record or we seem years behind on it, which would then have the complete index for the whole Congress.

Now, one of the things that is both a plus and a minus is that for the Member—a lot of us have a habit of getting the record, flipping the pages, seeing something that appeals to us and reading that. If I had to think through what are the things I am interested in, sure, I could think I am interested in hundreds of things. Most Members are. But I don't want to have to, even if I could get that daily index, which they could do for us on a keyword basis, I really don't have time to worry about that.

But flipping the pages and being able to look at the heading, especially an extension of remarks where it isn't uttered on the floor, it is something interesting that Members put you in, you see who said it, and what the region is, that helps me decide do I want to read this? And it might be something that isn't on my list of several hundred interests that day, but it is exciting. So I don't need the index. I need to flip that stuff.

Now, do I need to carry a laptop around so I can bring this up on a screen and wear my eyes out more than they are already worn out or what? Obviously, I am not going to lug some piece of machinery around all day.

On the other hand, I can pick up the record in all sorts of pieces. When I am done with that, I can put it back in the pile outside the Cloakroom. I can go on the floor. It is tucked under the seats and so forth and so on.

That is just one of the daily things that we run into that obviously can be—and it is digital now. I mean it moves directly from the Reporters of Debates on electronic medium down to the Government Printing Office. So there is a lot of things that could happen here, but you have to break our habits. And if you break our

habits we might be losing something. We might be gaining a lot. So I am trying to get the best of both worlds.

Mr. HOENIG. Well, I think the example you illustrate is actually a perfect example of one central point, which Mr. Huber referred to briefly, but I would like to enhance and emphasize, which is that applying technology is constantly an issue of deciding what to change and what not to change. Some things ought not to change. Books will still be around in 10 years and so will things that you flip through, because of the way the human mind works.

Mr. HORN. As a book collector, I am delighted to know that.

Mr. HOENIG. There are plenty of other people besides myself that are of greater expertise that can reassure you on that point. But I think your point is an exact illustration of that, that there are certain limits. There are people that are exploring technologies right now of electronic flippable books, but they are on the bleeding edge and it will probably be years and years until they actually go into production. People are thinking about it now, but in the meantime there are still going to be things to flip through.

I have heard testimony actually by the CIO of Mobile Corp. about a very successful system they put in place to flag regular interests of their senior executives that they feel has been very successful in at least slimming down the number of items that you need to flip through, and that is probably the ultimate balance.

Mr. HORN. Let me ask you a few questions for the record, and as you know, our practice might be when we think a few up later we would appreciate it if you would answer those, too. You are still under oath in all cases.

Mr. HOENIG. Be happy to.

Mr. HORN. The General Accounting Office has passed reports of identifying the success characteristics for using information technology and has sounded a warning for troubled systems as your presentation showed. How do we do a better job of identifying information technology system failures before they develop?

Mr. HOENIG. Well, there is two points I guess I would like to make on this. First is that it is an impossible task to go about, for this body or for any central government oversight agency, to try to identify all these projects themselves. So to do it efficiently and effectively the only way to do it is to require agencies to put processes in place that will identify these early and this comes down to this investment control process that we talk about. We have very specific guidance that we have put together on these processes and practices and are working to evaluate right now which agencies are putting them in place and which aren't. It is only with—by putting—forcing agencies to put these kinds of processes in place that you will ever get the kind of information that you need to effectively identify these systems' risks early on, I believe.

Mr. HORN. You showed us earlier a chart that purported to be what is the annual expenditure for the Federal Government now of information technology. Has the GAO ever done an assessment, either of certain departments or the Government as a whole, as to what is needed now to bring us up-to-date and to catch up with the best practices corporations that you are familiar with, what would it take to play catch-up here? What are we talking about, \$50 billion, \$100 billion?

Mr. HOENIG. Well, on that, the one conclusion that I have come to in looking at these situations in agencies is it is definitely not a question of spending more money, but spending current money much more wisely and shifting the existing mixes. In some cases, I think if effective decisions were made on these investments, you could even shrink investment over time and still get more value for the public's dollar.

In terms of analyzing where agencies are on these best practices, as I mentioned a little bit earlier, the steps that we have currently made are to try to put ourselves in a position where we can actually begin to develop scales to show where agencies are strong and weak on these practice areas and there are significant weaknesses.

We have found no Federal agencies right now that score above level 2 on any more than 2 or 3 of these 11 practices. Whereas, most of the organizations we studied were at level 4 on all of them. So there is quite a bit of time and effort that needs to be put to putting them in place, but not extra money.

Mr. HORN. Well, they have got money now on the hardware side. Is the hardware sufficient to do some of the things if we have the right software and the right organization of these systems, which is the most important thing? I mean, garbage in, garbage out, obviously. If you don't change the decisionmaking system and all of that, software to simply do rapidly silly things you are doing with paper doesn't solve the problem. You have got to rethink the system.

But what do we know about that on the hardware side?

Mr. HOENIG. Well, I think, as Mr. Huber mentioned actually this morning, the price performance rates of improvement on hardware continue to be doubling at about a 3-year rate based on most of the industry reports that I read. I think hardware is less of a problem than developing a lot of the complex software these days.

I mean, that is where a lot of the risk is in these system development efforts. That is where it is so important to be scaling up software development through the alpha and the beta testing at a particular scale, and then scaling it up that you mentioned earlier. That is really where I think the difficulty is.

The technology is out there and possible to solve just about any problem. The challenge is to define what the business problem is, and then relentlessly keep focused on it, develop a version of it that works, test it, implement it, get a result, and then scale it up in improvement going to subsequent versions and releases along the way.

Mr. HORN. Once we have identified that troubled system, in terms of the response you are saying we know enough now about what predicts these things. We can deal with it up front, and so is there anything else we can do at this point?

Mr. HOENIG. Well, I think that once an agency—if an agency does not have an investment control process in place, then the Congress can—can link its funding of information technology systems to the risk that they are going to be taking in investing in these new systems and encourage the—the agencies to put it in place.

If they do have it in place and a high-risk project has been flagged, then I think the appropriate corrective action is to require some kind of independent assessment of the project, to develop a

corrective action plan, and then to continually assess based on results whether this project is moving forward and effectively operating at a small scale, and then moving it up to a larger scale implementation, to watch it closely and have independent assessments, just as HCFA is doing actually with their IV&V, independent verification and validation, on the MTS contract.

Mr. HORN. Let's talk about that a minute. Does this include the auditing of medical bills that relate to certain operations, processes, procedures, so that you can determine that certain charges have been made, that had no business being made with that particular operation process, procedure, whatever?

There is software in that area, but as I understand it, it is held by a private company, and HCFA has apparently a problem in utilizing that. Do you have some feel for that situation?

Mr. HOENIG. Well, I guess in speaking about risk assessment and the role of independent audits, I was actually thinking more of a major lesson that we learned from the private sector companies that we went to. I think this is very illustrative and another very surprising thing to me.

The internal auditors or the counterpart of the Inspectors General were very close partners with the systems development teams at the front end of a project to independently assess risk. And we found that most of these organizations had two up-front independent risk assessments by the internal auditor, usually on 60 to 70 different risk variables ranging from data quality issues to fraud issues. I mean, many different issues in the systems development area.

So the internal auditor is the independent organizations were used to verify the risk and then force and push the agency or the organization to attack each one of those different areas and develop risk mitigation strategies very close up to front. So that is actually what I was thinking of in terms of the independent risk assessment.

Mr. HORN. OK. Now you recommended, of course, that Congress exercise active oversight of information technology projects. I note that the chairman of the full committee, Mr. Clinger of Pennsylvania, is looking forward to holding an oversight hearing in the next few months after the regulations have been written for the recent procurement legislation that was added to the defense authorization bill. So he will obviously very thoroughly go down what has happened agency by agency, OMB, et cetera.

Do you already have any calls from the executive branch seeking your advice since you have really gone over a lot of this, and you are a storehouse of information on the subject in Government? Do people seem to be wanting to move on this with some rapidity?

Mr. HOENIG. One of the things that we are actually very pleased about, Mr. Chairman, and that was part of our idea 3 or 4 years ago when we started this work, was that it would be most constructive for the public if we created some kind of an intellectual capital on this whole area that was open and accessible to any member of an agency regardless of branch of Government so that we could develop some professional consensus on how to implement these factors.

So we have been working closely with—not only with agencies, but with members of the executive branch to try to, within our own statutory role, answer questions from a research perspective on how organizations do this.

So we aren't prescriptive about exactly how to do it, but try to offer different models from the research that we have done and allow them to make intelligent choices based on the information we have collected of what the leading edge is and how to solve these problems. Sometimes everybody is doing it pretty much the same way, and it is a very simple answer, and other times there are three or four different models out there and they need to make a choice. But we have had a lot of requests for information about how to answer the questions of what are the qualifications for a CIO; how exactly do you put an investment process in place; what do you mean by an architecture to support business process re-engineering; and we are frankly a bit overloaded with those requests right now.

Mr. HORN. Has OMB done work similar to what GAO has done? Are you the only place in the Government where we have really had an extensive review of best practices?

Mr. HOENIG. Well, we found actually in our work, in our interaction with professionals around the Government, that there have been individual agencies, for instance, that have taken the initiative to go out and learn from other organizations and selected partner organizations or done benchmarking. So we have found some selected organizations that have done that.

The Coast Guard has been very aggressive, the Army Corps of Engineers. The OMB and GSA have done some selective efforts, but one of the things we have tried to do is not create unnecessary redundancies there as oversight organs and identified—once we identified an area, we tried to make that information available to other Government entities so that they don't have to repeat our efforts, save a little bit of time and effort.

Mr. HORN. So you have served as a resource, but GAO hasn't done a draft regulation that might be a model based on your experience? Is that considered outside of GAO's scope of work or have they ever done a draft regulation when they have been intimately involved?

Mr. HOENIG. We try to keep ourselves to the role of answering detailed questions about what we know from our research as opposed to prescribing or drafting particular regulations. We feel it is more helpful, more appropriate and that we actually get more requests for information and can be more constructive by offering that kind of alternative, in a very detailed fashion, mind you, rather than drafting regulations.

Mr. HORN. How can we in Congress do a better job in our oversight responsibility in this area, both on the appropriations side, the authorizing side and the oversight committee side? What ought we to be doing that we are not doing?

Mr. HOENIG. Well, one of the—if I may just reinforce one positive thing that I think you are doing is working across the multiple committees through the oversight in authorizing and appropriating process, for instance in the joint hearings that you held on the MTS development, because it is very easy for agencies to divide

and conquer on these issues. And I think that sort of coordinated oversight through the entire process is extremely effective in focusing attention and resources on very particular issues.

I think the area where there is probably most potential for the future is making the specific—is constantly asking this question of what did you spend and what did we get, and not letting agencies off the hook. It is really the only surrogate that we have in the Government or one of the only ones for real market forces. And the experience that we have had—and I might ask my colleague, Dr. McClure, to comment on this just briefly.

The Coast Guard is a good example of an agency where this strategy was brought to bear and with this kind of pressure, agencies really are forced to respond and itemize and with the consistent pressure some change can really be instituted, and at the same time provide the Congress with more quantitative information which allows you to justify to your constituents and stakeholders what has been achieved for the public investment.

Mr. HORN. Dr. McClure.

Mr. MCCLURE. Yes, I think the Coast Guard example is a good one. It was based on an audit that we did back in 1990 where we found some problems with the strategic IT approach being taken by the Coast Guard. And the oversight committee basically threatened to withhold IT funding until a strategic plan had been put together that showed how their IT spending was linked to mission improvement. That was the forcing function that caused the business and program side of the Coast Guard to get serious about how they were spending their IT money. It was quite an eye-opener.

Mr. HORN. Now, have you kept track of what the Coast Guard is doing in this area?

Mr. MCCLURE. We have been involved in looking at their progress and, as Mr. Hoenig said, they have some of the selection criteria for making IT investments that are very similar to what we saw in the private sector. There are still things that, like any organization, they need to work on, but they are very far ahead of what we have seen in other Federal agencies.

Mr. HORN. Well, I have been impressed by some of their work also, although I have a bone to pick with them when they want to build VTS systems, as they are called. You are familiar with that, are you?

Mr. MCCLURE. Vessel traffic.

Mr. HORN. Yes. In the various ports, when the port of Long Beach, which is the largest port in America, the port of Los Angeles, which is second largest. And they are both in my district, their headquarters. They have done this on the private sector for years; and have most efficient operation in the country. They reimburse the Coast Guard for six positions they borrow from the Coast Guard. The Coast Guard makes money off of them.

We have had a separate hearing by Mr. Coble of North Carolina, who chairs the relevant subcommittee in the authorization side on this. It is silly for the Federal Government to be paying for this, when Long Beach and Los Angeles have proved you simply put a small fee on the container flowing through by the millions, and you can get the money you need to run the system. And it is a very

up-to-date system, obviously. They are taking the best of technology they can find anywhere.

So I mean—I hate to see us when we get into these things, not only not do what the private sector is doing, but also pretend you need Government money to do it, because you don't if you can bill back to the user. And the user is quite happy to pay the fee when they can move in and out of that port in 8 hours and not sit around at sea and never be unloaded.

I remember once when I was in Singapore many years ago, and I am sure they have improved, counting 103 vessels sitting out beyond the harbor waiting to be unloaded. That doesn't happen in southern California.

One of the things you mentioned earlier, of course, was competition is a basic factor to get the juices flowing and to get the job done. I can certainly think of that in two newspapers, the Orange County Register and the Los Angeles Times Orange County edition.

Over 30 years, the confrontation of those two papers has meant an improvement in both newspapers. The editors of both have told me this years ago, that the competition was good for them because when they had a monopoly, as Government has a monopoly in most areas, not much happened. Monopolies just take the customer for granted, and that is the way it was.

But competition has changed that. And I guess one of our goals is to see how do we build competition in? Well, you sure can do it as you suggested through the budget process. Those people that get their house in order get rewarded. On the other hand, it means that those that don't know what they are doing lag further and further behind. And who is hurt? Well, the customer; namely us, and we, the taxpayers.

So we have got to sort of have a carrot stick operation. Leading people to the promised land and not having a few real laggards out there. You look at Defense. We had a hearing on that a few months ago. Forty-nine separate accounting systems in the Department of Defense. No wonder they can't find \$15 to \$20 billion. They assure me it isn't stolen but, you know, when you can't find it and relate it, you wonder what are we doing?

Mr. HOENIG. Your point on the carrot and stick is actually one of the most consistent best practices we found in the corporations; they went to. They used just those words, facilitating success and reinforcing accountability. One of the things I think is an underutilized—another underutilized approach that the Congress could use more in terms of facilitating this kind of competitiveness and apples-to-apples comparison is benchmarking. The travel processing area is an excellent example of that.

Some work that we had done for the Senate several months ago on DOD travel process reengineering focused on benchmarking the processing costs versus the private sector. Once you can identify a quantifiable gap with a comparable process, you can begin to show very clearly what the cost to the public is of the status quo. And benchmarking is something I think that could be used much more frequently and should be a question that agencies answer more frequently is, compared to what, if you are successful compared to what?

Mr. HORN. Right. Well, I think what you have done is broaden the dialog here so they can't simply talk about what we do in this agency or this. Your competition mark is the private sector. And we look at the businesses that prospered in this recent recession, depression, however you want to call it. But you look at the customer-oriented corporations that care about the person coming in and spending money, they benefited. And the ones that were lagging behind in information technology and service and everything else, when people have a choice, those people go to somebody else that cares about them. Common sense. It doesn't take much.

Mr. HOENIG. Exactly.

Mr. MCCLURE. Mr. Chairman, I might also mention that even as our research indicates, there are many public sector organizations that do this very well and we really need to highlight and showcase that it is done in the public sector, both Federal, State and local government agencies. There are some beautiful case studies of where customer service, quality and speed are all being improved. So it is not just private versus public. It is doable in the public sector.

Mr. HORN. Right. I am familiar with Mr. Osborn's ground breaking book that set a few people on their ears in local and State government, and started them looking at what some of their colleagues had already done. We have had him as a witness and I know there is a society on innovation that he chairs that has done a lot of good in spreading these ideas.

Is there anything else GAO plans to do to pull all of these pieces together for us? Have you got any thoughts on what the next step is to keep the movement going?

Mr. HOENIG. Well, one of the things that—there are a couple different lines of effort that we are pursuing. One line of effort is continuing to develop guidance and methodologies for evaluating how to do these things in the areas of IT performance measurement, strategic planning and organization and skills encompassing the sort of the CIO area.

In terms of best practices, we are also designing work right now to get a better handle on where the real successes are in the re-engineering arena. One of the things personally that I have noted from a lot of the published research on reengineering is that it is—many of—much of it is very imprecise about what the specific benefits that have been achieved are and how they have been achieved. And so we are now going to try to, by looking more—in more rigorous detail at Federal, State, local and private sector examples of re-engineering, try to document what some of those best practices are and what is really possible in the Federal Government. So that is another line of effort that we are pursuing.

I think those two, as well as continuing research and working with any organization that we come across that appears to be successful in this and how to learn from it, all three of those together should keep us up-to-date and focused on implementation problems.

Mr. HORN. Now, as we see a role for this chief information officer at the departmental develop, is this essentially replacing the management officer, if you will? When you look back to the 1930's and the evolution with the Hoover Commission in the 1950's and start-

ing in the late 1940's of the sort of Assistant Secretary for Management, that Assistant Secretary encompassed all of these areas that we are, in a sense, giving greater prominence to.

Some agencies the Assistant Secretary, for example, is also the Chief Financial Officer. I personally don't think that is a good idea, and I needle them every time they come up here but they are happy with that. It just isn't doing the job, in my humble opinion.

Now, with the Chief Information Officer, I take it, we expect there to be a separate category of senior management in an agency. Yet, we could have Cabinet Secretaries put the Assistant Secretary for Management in as the Chief Information Officer.

Usually, in recruitment of these individuals, you have people coming out of completely different backgrounds, and you are not going to find more of the—many of the traditional managers, unless they have substantially retooled themselves, who are very fine managers, per se, as knowledgeable as they need to be to provide some direction in all these areas. Not that they have got to be a computer nerd or have been the—you know, playing with computers since they were 4. But the fact is, they have got to ask the right questions, run the whole organization, get the show on the road, monitor and do all of those good things managers do.

Do you see difficulties in finding the people to fill these roles and what has been the experience so far?

Mr. HOENIG. I think you are right about the overall evolution from general management administration to breaking out these individual functional areas, CFO, information and human resources ultimately eventually probably also as well.

What we have seen so far in terms of the CIO implementation is the guidance—the law is fairly light on credentials and requirements. And one of our, I guess, strong positions would be is that it is very important for OMB to be developing guidance in terms of credentials and requirements for these Chief Information Officers, and they should be including not only technical knowledge, but also business knowledge, the personal characteristics and abilities that allow an executive like this to work with their line management colleagues, as I am sure your own CIO did with you at the university, and also equally important is a proven track record.

Have they actually been able to deliver real results in the past? OMB needs to really take some leadership in defining what those credentials and requirements are.

There are clearly going to be barriers to implementation. In some cases, it may be purely salary and an ability to compete competitively for salaries. In other cases, it may be the fact that legislative changes are required in a particular agency to actually create a new position that will focus on this, even though the legislative language in the new law requires this as a primary duty of the individual.

An even thornier barrier, in my conversations with private sector CIOs, one of the most consistent concerns they have is coming to work in an environment that is not results-oriented. I mean, these people are people who like to build things and get things done. And the idea of coming into a nonresults-oriented environment where they are not pushed and able to really produce things is thoroughly disenchanting to them.

I think that may end up being the biggest barrier. If the CFO Act is any history, it is going to be 2 or 3 years, with a lot of effort in defining these requirements and recruiting at the highest level, at the Cabinet level probably, to begin to bring in the kind of people that we need. And what I hope is that OMB and also the Congress, in looking at these kinds of credential requirements, doesn't do this in a vacuum, but invites CIOs, successful CIOs in from the States, as you are doing this afternoon, and from the private sector so you can talk to these people and learn from them about what they view the key requirements for executing this position are.

Mr. HORN. As you know, this committee has recommended that there be a separate Office of Management separate from the Office of Management and Budget, and that would go back to being the Office of Budget. As many people know, who have suggested this idea, I have not been too keen on that idea over the last 10 years when it has been voiced because I felt that the budget power might help get some things done. But I have had enough people convince me that it isn't working. Budget is pushing out management considerations.

What is your feeling on that as to—if we can create that Office of Management, does this function necessarily go with that rather than the budget side? Obviously, they would have to work with the budget side on the budget coming out of the department.

But where does this stand in terms of management consultation and advice, which is the whole purpose of a separate Office of Management?

Mr. HOENIG. Let me just start on that with what we have learned from our research, and I think that pretty much comports with your initial intentions that you shared; that at least out in the corporate world, in the States and agencies that we looked at, and this includes looking at State oversight organizations, we tended to find the successful ones were where management and budget were mixed and where they had grasped the mettle, so to speak, and successfully combined budget decisionmaking with an overall management approach. Not that it is an easy thing to do, but without grasping that mettle, it never really works. So that is definitely what we found out there.

I have to—I feel pretty humble about the problem—commenting on the problem over at OMB and have only anecdotal experience and isolated experience in the IT area in working with individuals over at OIRRA on particular individual's—information systems efforts. I have found, and this is only isolated experience so I would be very hesitant to generalize from it, but in the past 2 years—I have been here in the Government for 4 years working with these—this organization. I found a noticeable improvement in the ability to work through OIRRA into the resource management organizations on information systems issues over the past few years as opposed to 2 years hence prior to the OMB 2000 effort.

I don't think that is—and we have reported on this. I think you are familiar with our reporting. That is not indicative necessarily of any overall success, but I would be very hesitant to take a position on what the right solution is. I have seen some improvement in my own area.

Mr. HORN. Mr. Scarborough noted the training requirements that are involved in any massive turnaround in this area. How do you see that training, being really dependent solely on the decisionmaking of the agency involved? Do you see the Office of Personnel Management setting up overall training across the Federal Government? What has been the successful way that the public and private agencies have done this?

Mr. HOENIG. Well, this actually is a model pretty close to the investment model. As opposed to the corporate or oversight bodies deciding what the training is, they have, instead, focused on getting agencies to put in training assessment systems and making sure that they are accountable for continually assessing skill needs and training needs and allocating scarce resources to the right skills. That has been one element. So the focus has been more on agency training and skill development systems.

The second element is that in the technology area in particular, the leading organizations did not spend a lot of time training people in new technologies, but rather they focused on technology independent skills, and this goes back to another point that Mr. Huber raised, I think, which is the technology cycles are going to continue to shorten.

No organization is going to be able to get away from refreshing the desktop every 2 or 3 years, so the real strategic focus is in developing business process reengineering and analysis skills, facilitation and leadership skills, a lot of nontechnical or technology independent types of skills both in management and in IT staff so that they can withstand and continue to cope with these waves of technology that come into the organization. That has probably been the biggest shift that we have seen.

Mr. HORN. Inspectors General, that is probably the oldest of the new type of officers that we have in Federal agencies. In your surveys, what type of help and advice are being given by Inspectors General to agencies, both the agency heads and the people charged with specific information, resource management?

Mr. HOENIG. Well, in the Federal sector, I think, Mr. Chairman, it is a pretty mixed bag. There are some very positive examples, and others where there is probably more neglect. It is very mixed. But what we have found in the—and I guess I have referred to this once already, but just to reinforce it, the role of the internal auditor in the leading organizations we studied was very, very strong. And I guess I would say this is probably the single most important challenge over the IG community, over the couple coming years as we begin to implement these new ways of doing business, is to focus up front on risk assessment and cost-benefit risk assessment of these new information systems so that they can produce reliable information not only for agency decisionmaking, but for congressional decisionmaking, that people can count on, and that allow the costs and the benefits and risks to be weighed by executive decisionmakers in order to make good choices.

This is an area where there is a long ways to go, and that up-front risk assessment, there are numerous very specific and executable risk assessment models that we have come across that we would certainly be happy to discuss with any of these Inspectors

General, and are going to try to do that in terms of implementation. It is a big opportunity.

Mr. HORN. I agree. You have got the Government Performance Results Act. You have the numerous hearings all of us have held, some at the authorizing appropriations subcommittees on benchmarking rather than thinking about processing. And the Inspectors General who have both a financial audit, but also a programmatic audit role, just as the GAO has, can contribute a lot to this dialog and ought to be in on the ground floor.

If I were a Presidential appointee or a nominee, before I went up to the Senate, the first person I would try to sit down with is the Inspector General, the budget examiners, both at the central government level, as well as departmental level. Then you really should find out what goes on in this agency.

So do you see any conscious efforts being made to include the Inspectors General or are they just putting them off in a building and hope they don't write a nasty report about something?

Mr. HOENIG. The best way I can characterize it since we haven't done any specific work on this, would be mixed, which I think is an appropriate characterization. There is a long ways to go in terms of putting these kinds of systems in place. And you are right, the places we studied absolutely relied on their internal auditors.

And one of the quotes that I remembered most clearly from the internal auditor that was—when he was asked by some of our executives about the independence issue, in fact, they seemed to be working so closely with the line organization that they were concerned about independence, and he said, my professionalism determines the limits of my independence. And so these were smaller, very highly trained audit organizations that could go shoulder to shoulder with the line professionals on all of these issues and really serve a reinforcing function.

Mr. HORN. OMB has additional responsibilities for information technology as a result of the Information Technology Management Act within that Defense Authorization Act. With its small technical staff and the natural tendency for budget issues, as I suggested earlier, that absorbs most of the people's attention at OMB. Should we be concerned if OMB assigns individual agency budget examiners to oversee information technology projects? Is that the right way to go?

Mr. HOENIG. I think if we see individual OMB program examiners looking at individual projects, I think we should be very concerned. The only possible way for the Office of Management and Budget to exercise the appropriate leverage over agencies is for these program examiners to become portfolio managers as opposed to project overseers. That is the direction I believe OMB wants to go and it is going to be a very hard change for them to make. That is what they should be focusing on, is looking at a whole portfolio of information technology investments.

In the FAA's case that would be over 120 separate projects. And overall, is the agency maximizing the return to the public and minimizing the risk of that entire portfolio? I think that is the only way to go.

Mr. HORN. Very good. Counsel, anything else we need to ask?

This will be the last question of the panel and then we will take a recess.

In your testimony, you say many Federal agencies do not have a rigorous information technology investment decision process, which is what you are advocating. Do you have any comments on OMB's publication, "Evaluating Investment and Information Technology, a Practical Guide?" That was released, I believe, last fall. And have you had an opportunity to look at it? Have you got a reaction to it?

Mr. HOENIG. That is actually a very good example of the situation that I described earlier when you asked about how we are relating to these other organizations in terms of providing information. OMB consulted with us regularly on our knowledge in research and putting together that guide. So we feel like it is very firmly founded in best practice and in the research that we have done on these leading organizations.

The real challenge with that guide is for OMB to be doing the training internally with their programming examiners and to integrate it fully into the budgetary decisionmaking process to create these portfolio managers. That is not going to be an easy transition, but they are definitely going in the right direction with that guide. The challenge now is to make it work budget cycle after budget cycle.

Mr. HORN. Well, very good. Do you have any other points you want to make on anything else we should have asked and didn't have sense enough to ask?

Mr. HOENIG. I guess I will just make—maybe make one comment, going back to one of the questions that you asked about what are sort of the early warning signs in some of these systems. It may seem like a little bit of an oversimplification, but I guess—I think it is a very important point. In our experience, the most important early warning sign of a problem in a major system effort is either the fact that there is no information or somebody says there is no problems.

Mr. HORN. Right.

Mr. HOENIG. Those are the two most important early warning signs. And as long as everyone recognizes that, then we have a chance of managing the risk of these large systems development projects more effectively.

Mr. HORN. I have seen that mentality in a number of organizations, you brought a smile to my face on that comment. It is unbelievable that people do those things.

Well, we thank you for your excellent presentation and testimony and we thank all of your colleagues that helped you. We appreciate you sharing that with us. There might be a few questions we will ship down to you, and you have always been generous enough to answer those. So thank you very much.

Mr. HOENIG. Thank you.

Mr. HORN. We are going to go into recess at the fine cafeteria we have in the Rayburn here and we will come back at 1:30 and begin with that last panel three. So we have got an hour to make phone calls, eat, sun yourself in the 80-degree weather, whatever. We are in recess.

[Recess.]

Mr. HORN. The Subcommittee on Government Management, Information, and Technology will resume its session with panel three, Dr. Renato A. Di Pentima, Mr. John Kost, and Mr. David R. Brooks. The tradition in this committee is to administer the oath to all witnesses.

[Witnesses sworn.]

Mr. HORN. Our first speaker and presenter is Dr. Renato Di Pentima, the vice president and chief information officer of SRA International, Inc.

STATEMENTS OF RENATO A. DI PENTIMA, VICE PRESIDENT AND CHIEF INFORMATION OFFICER, SRA INTERNATIONAL, INC.; C. MORGAN KINGHORN, FELLOW, NATIONAL ACADEMY OF PUBLIC ADMINISTRATION, AND DIRECTOR, COOPERS AND LYBRAND CONSULTING; JOHN M. KOST, CHIEF INFORMATION OFFICER, STATE OF MICHIGAN; AND DAVID R. BROOKS, DEPUTY SECTOR VICE PRESIDENT, HEALTH CARE TECHNOLOGY SECTOR, SCIENCE APPLICATIONS INTERNATIONAL CORP.

Mr. DI PENTIMA. Mr. Chairman, thank you. I appreciate appearing before you today to provide some comments on best practices for information technology in government. I have submitted my comments for the record and would like to add a few brief comments.

I come as a CIO of an integration and software development firm and with 30 years of government experience, having retired as the Deputy Commissioner of Social Security where I was responsible for information technology and computers in Social Security.

I would focus my brief comments on the concept of investments: Government investments and best practices for them. When I look at Government, certainly in the 2 or 3 years before I left last year, virtually everything in the Government is driven by the need to run more efficiently and downsize. Government is coming down to 272,900 people; more than halfway there.

The best way to achieve productivity gains is through sensible use of information technology. When I think about that, I think about how a private company would look at its investments, and I see a pretty stark difference on the private side from on the Government side. My company is not unusual. In looking at an investment, it will generally look at the expected revenues over the next 5 years. It will look at its expected expenditures over the same 5-year period and look at net income anticipated, hopefully profits. It would then look at any investment or capital expenditure it was considering making and look at what the impact is on that bottom line. If there is a decrease or even a minus in the short years, you would expect to have a greater profitability in the outyears. In looking at that investment, we would consider what other alternatives do we have for these moneys, what other ideas are competing for these funds, what about the alternative of simply keeping them in reserve, buying back our stock, retiring debt or sharing dividends with shareholders.

If we decided to go ahead with that investment, it would be followed by a very detailed project plan; certainly some senior officer of the corporation would have it in their profitization plan that this

investment would be a success. There would be specific metrics to measure the progress of this investment. There would be great consideration about are we building new or using commercial-off-the-shelf software, and the risks involved in the venture. Then we would watch it very closely to make sure that it was achieving the path that we had laid out for it, and if not, then take corrective action which would include stopping the investment.

We would also measure what we were doing by outcomes: What do we expect from this investment, are we going to increase our market share, are we going to open up a new product line which will produce more income? When I compare that to what I did in the same roll in Government, what my colleagues did, there is a stark difference. I don't believe that the Government followed the same rigorous investment process that you would see on the private industry side in the brief way I have described it, nor do they focus all the time on outcomes. It is generally outputs. The example that I use is it is interesting to know that IRS or Social Security might answer a million telephone calls this month, but if there were 10 million calls that is not such a great measure.

So what we need to be looking at in these investments on the Government side, is what outcomes are we achieving? Are people waiting 15 minutes instead of a half hour because of this investment? Will people get their benefit checks on the first date they are entitled to them? Will we have less mishaps and delays at our airports? What are the outcomes that we are going to get from this investment?

So in closing, I would say that I would urge the new position of CIO coming out of the reform legislation to focus on these types of things as maybe one of the primary functions of the job, and there has to be a greater discipline in how we invest funds in IT in Government.

[The prepared statement of Mr. Di Pentima follows:]

NOT FOR RELEASE UNTIL
DELIVERY February 26, 1996

STATEMENT OF RENATO A. DI PENTIMA
VICE PRESIDENT AND CHIEF INFORMATION OFFICER
SRA INTERNATIONAL, INC.
BEFORE THE
SUBCOMMITTEE ON GOVERNMENT MANAGEMENT,
INFORMATION AND TECHNOLOGY
COMMITTEE ON GOVERNMENT REFORM
AND OVERSIGHT
UNITED STATES HOUSE OF REPRESENTATIVES
FEBRUARY 26, 1996

Mr. Chairman and members of the subcommittee, I am very pleased to appear before you today to discuss using the best practices of information technology in government.

I am addressing this subject today as Vice President and Chief Information Officer of SRA International, Inc., a leading systems integration and information technology company, and as former Deputy Commissioner in charge of systems for the U.S. Social Security Administration. In the latter position, I also chaired the Federal Information Technology Acquisition Improvement Panel, many of whose findings were incorporated in recently enacted reform legislation.

The use of information technology now permeates all parts of an organization. With respect to the Federal government, the emphasis on constrained budgets and downsizing has made computers and other forms of information technology often the only strategic tools available to achieve greater productivity with less resources. It is, therefore, more important than ever, to assure that the government's decision making with respect to information technology investments is strengthened.

In that regard, I would like to briefly cover some suggested areas of improvement; areas in which I believe the new government Chief Information Officers should play a major role. For me, these are best practices for making information technology investment decisions.

Investment Choices and Outcomes

In the private sector, competition in the marketplace compels a rigorous investment decision process. Simply put, a company contemplating a major investment will examine its five-year forecast of revenue, expenditures, and resulting net income (hopefully, profit), estimate the new investment flow over this same period, and assess the resulting impact upon the net income—generally expecting to increase the cumulative net income over the period under consideration. In other words, it predicts and evaluates the expected outcomes of this investment in clear business terms. Will it increase market share? Revenues? Profit margins? Will it increase productivity, measured for example by the revenue per person (total revenue divided by total employees)?

These, or other measures like them, are used to evaluate the outcomes of the investment as well as their merits or benefits.

In addition to assessing the expected outcomes of a particular proposed investment, a private sector company also needs to compare each investment opportunity with other possible investments or uses that can be made with the funds, people, and time under consideration. How else might these monies be used? And, what are the comparative advantages and disadvantages of those other choices? What is the comparative value to the company of using these monies for other investments, or keeping it in reserve, or retiring debt, or increasing dividends to stockholders?

Tracking and Measuring Investment Outcomes; Course Corrections

In the private sector, once a decision is made to fund the proposed investment, the initial business plan is expanded to a more detailed plan including project management plans, milestones, roles and responsibilities (without a doubt some senior manager's compensation plan will be tied to this investment's outcomes) and metrics for measuring progress. The latter becomes particularly important because the progress and outcomes of the investment are continuously tracked, measured, and assessed. If the plans and outcomes are not proceeding as expected, course corrections are considered in a range from modifying the plans, timing and expected outcomes to terminating the project and investment to minimize loss. And these corrections are made quickly, with a primary focus on future outcomes — not sunk costs.

Parallel for Government

I believe these best practices should be applied to government technology investments. More rigorous investment analysis and evaluation must be conducted within agencies as part of the annual budget submission process. Expected outcomes not outputs, must be identified, measured, and tracked. For example, answering one million telephone calls is an impressive output measure that may be totally inadequate performance if there are ten million calls to be answered. A more meaningful measure would be how many calls are answered on the first dialing. Similarly, what impacts do investments in more computers and information technology have on outcomes such as reducing waiting times when visiting government offices, increasing the percentage of people receiving benefits on the first day they are eligible for them, and reducing the number of air traffic delays or mishaps rather than on outputs such as how many computers are installed. Outcome measures are far more appropriate than output measures in assessing the real value of an investment opportunity. Output is a level of effort; outcome is the objective we are after.

I believe the best practices need to include a rigorous, disciplined information technology decision process based on assessment of the investment stream, expected outcomes, evaluation of alternative uses of the investment funds, specific metrics to measure progress when the investment is made, and continuous tracking and measurement of performance and outcomes with course corrections where appropriate.

There are some in government who might argue that they do that today. I would respond that they are small in number. After 32 years with the Federal government, having served many of them as a senior executive, and having been a member or chairperson of a number of government panels examining information technology investments and projects, I have not seen this same discipline and rigor practiced on a wide-spread basis. While in some agencies, like the Social Security Administration, it is more and more representative of how it does business, many others, well known to this subcommittee, have witnessed major investments and projects, once started, consuming billions of dollars without measurable results or expected outcomes. For that reason, I compliment this subcommittee for holding this series of hearings to focus on using best practices and identifying specific lessons that could be adopted by government.

This concludes my prepared remarks. I will be happy to answer any questions you might have.

Mr. HORN. Let me read part of your penultimate paragraph which you didn't read although, granted, it is in the record.

You note: "There are some in Government who might argue that they do today what you have advocated, which is having a disciplined information technology process based on this assessment of the investment stream, the expected outcomes, evaluation of alternative use of investment funds, et cetera."

Then you say: "After 32 years with the Federal Government, having served many of them as a senior executive, having been a member or chairperson of a number of Government panels examining information technology investments and projects, I have not seen this same discipline and rigor practiced on a widespread basis. While in some agencies, like the Social Security Administration, it is more and more representative of how it does business, many others, well-known to this subcommittee, have witnessed major investments and projects, once started, consuming billions of dollars without measurable results or expected outcomes."

I wanted to get at your experience using what we have in a short time. I mentioned the FAA example this morning. When I was on the Aviation Subcommittee in 1993, we looked at that. Everybody wanted their bells and whistles on it instead of thinking through what are we trying to accomplish and who are we trying to serve. So I commend you for that. That is very helpful.

The second witness is Morgan Kinghorn a fellow of the National Academy of Public Administration, director of Coopers and Lybrand Consulting.

Mr. KINGHORN. Thank you, Mr. Chairman. I come to the panel with 25 years of experience with the Federal Government as a public servant, primarily in the financial management arena, the last 5 years as CFO of the IRS, and previous to that for 10 years Budget Director, Acting Deputy CFO and CFO at the Environmental Protection Agency. It is a real privilege for me to be here because these are issues that many of us, including the former speaker, struggled with for the last 3 decades trying to bring to the forefront of government management.

The Academy for which I am speaking not necessarily for here, is an independent, nonpartisan, nonprofit organization chartered by the Congress to actually work on issues both for the Congress and for executive agencies in these very subject matters.

My written statement highlights a series of key themes we identified through the Academy's research as well as some experience I have had in the public sector. But in my testimony I would like to focus on the essential elements of those themes; first, some suggestions I have on the creation of more dynamic performance measurements, particularly in the area of investments in information technology; and second, I would like to offer some observations regarding sort of broader organizational and investment strategies to consider when making decisions on information technology.

We are all here for a lot of reasons, but one is that the Federal Government does have a mixed record in using and accounting for information technology and investments in its operations and provisions of service to its citizens. It is not unusual, obviously, to read in papers and trade journals of information technology projects which substantially overrun budgets, are behind schedule or most

importantly, do not meet the intended expectations of either those designing the system or their users. But the problems are similar in the private sector.

The solutions may be different, as the former speaker indicated, but Government is not alone in having these issues. In my mind, it may be that part of the problem in the public sector associated with the difficulty of bringing about large-scale information technology is the complexity of the client base or scale of the mission. That clearly is a complexity that I have witnessed. However, I think in a more strategic sense the problems stem from more fundamental flaws.

First, I think is the failure or inability to match performance against promises; second, to procure and implement investments in technology in a reasonable timeframe, which I hope procurement reform, which this committee has been part of will help; and to constantly renew the personnel resources building such technology or the personnel trying to use that technology. Fortunately, we can draw on some important lessons of best practices, but what I would like to focus on today is the issue of matching performance against promises because I believe that is a fundamental issue.

Increasingly, the measure of success for information technology is in performance, how well does the technology actually support and contribute to the success of the organization. Problems arise, I believe, because it may be that the wrong promises have been made because there is not a clear understanding of the real linkages between investment in technology and the overall mission or strategy of the organization.

I recently chaired an academy panel that provided an assessment of recommendations for performance measures and management controls for the Department of Defense automated information systems. In our report, "Information Management Performance Measures," we recommended that DOD establish a broad performance framework, which is the integration of specific goal setting performance measurement and management controls, and a set of outcome-related and oriented performance measures.

We also proposed a strategic road map of near-term and long-term steps that would get DOD to an ultimate vision of having been able to measure performance against promises. The academy recommended that for DOD the focus should be to design measures of performance that had impact both on the strategic objectives of an organization and the day-to-day tactical work employees on the work site or, in DOD's case perhaps on the battlefield, undertake each day. The difficulty in creating such a set of measures, particularly in DOD, is that they can instantly become so global as to be meaningless, or so specific there are simply too many to deal with in an effective manner.

The answer obviously lies somewhere in between. There needs to be for DOD, as we recommended, a hierarchy of measures that tie the strategic objectives of an organization, the readiness of a soldier in DOD for instance, to the more mundane, but critical day-to-day outcomes of an organization, the decreasing lead times to supply and produce a key repair part for that soldier in the field. Only measuring the timeframes it takes to deliver a new system, which is often what we do measure in the IT area, may say nothing

about the true outcome of that effort, soldier readiness or, in the case of IRS, for instance, more error-free tax returns. The fact that the system was delivered perhaps quicker is not a sufficient measure in itself, but is often the type of performance measure put forth for technology investments today.

In the course of our panel's deliberation, we identified several factors critical to the success of using performance measurements. I would like to focus on two of them today. First, senior management must be involved and stay involved. Performance measured is an iterative process. This is essential because one of the continuing causes for failure in managing IT is that it takes more than technology wizards to contribute to failure or, hopefully, to success.

Just as often as not, program officials, those using the ultimate technology, fail to define programmatic objectives in a timely fashion. Senior management, the most senior management of an organization, must focus on the integration between the technologists and the program individuals.

Second, a concept called a balanced scorecard is useful in ensuring the key perspectives of the organization are reflected in the development of measures. In an excellent article in the latest Harvard Business Review, Robert Kaplan and David Norton state they believe that a scorecard approach addresses a serious deficiency in traditional management systems, their inability to link a company's long-term strategy with its short-term actions.

Their finding reiterates what we found in the academy with DOD, in my experience with other agencies that most organizations still emphasize short-term financial and operational measures without looking at appropriate linkages to an organization's strategic objectives.

However, often organizations jump to broad strategic measures that have little meaning or connect to the people in the field. Again, the answer lies in developing a series of measures that bridge organizational hierarchies from the top executive down to the worker in the field as well as internal and external expectations for success.

These success factors also influence the second area that I would like to focus on and conclude with, which is what are the issues in terms of making decisions on information investments. First, there must be a strategic perspective. How does the information technology accomplish the organization's overall mission?

For our DOD study we suggested as one strategic technology measure, how well does the new technology decrease the cycle time for the delivery of an internal service or product? In effect are supplies, in terms of a new supply system, are they being delivered in a faster timeframe with at least equal or better quality? That is a strategic perspective.

From an internal business perspective, how well information products and services are functioning to improve performance of programs and/or reduce costs, usually FTE or people in the Federal perspective? This is the most traditional measure of why someone would make an investment, and it is the one used by most Federal agencies, the saving of internal FTE. However, productivity outcomes should not be the only criteria, and I think for many investments that is where we as Federal agencies focused on.

Third, customer perspective: how internal and external customers see the information products and services. This area is one that is ripe for inventive work on the impact and cost of technology. What is the value, for instance, of investing in digitizing tax returns that will eliminate keypunch errors and therefore reduce the burden on the taxpayer in terms of rework or response to notices?

Putting viable numbers to a taxpayer in terms of the estimated reduction burden, however, is not an easy task. For DOD, one of the recommended measures was the change in percentage of satisfied customers primarily internal due to more timely delivery, improved functionality and degree of system integration.

Finally, an innovation and learning perspective has to be considered in terms of investments. Do the design and the application of the information management initiatives foster innovation, learning, and work force and organizational increased capacities? That is one of the additional kinds of measures that I think have to be considered in investing in technology.

Mr. Chairman, I believe that improved performance of organizations in their use of technologies requires starting at the beginning: Defining the mission, defining the day-to-day strategies to reach that mission, and then developing a series of performance measures that engage a broader array of considerations than has been traditional. Some call that approach a balanced scorecard; others call it common sense. I call it difficult to define and often difficult to implement, but it is essential to begin that process.

Thank you, Mr. Chairman.

[The prepared statement of Mr. Kinghorn follows:]

**C. MORGAN KINGHORN
FELLOW
NATIONAL ACADEMY OF PUBLIC ADMINISTRATION**

Mr. Chairman and Members of the Subcommittee:

I am C. Morgan Kinghorn, a Fellow of the National Academy of Public Administration (the Academy) and currently a director with Coopers and Lybrand Consulting in McLean, Virginia. I recently retired from the federal government after 25 years as a career public servant, the last 5 years as the chief financial officer for the Internal Revenue Service. I also held senior positions at the Environmental Protection Agency and at the Office of Management and Budget. It is a privilege for me to be here to participate in your deliberations on government information technology.

It is both timely and encouraging that your subcommittee is considering all aspects of the use of information technology in the federal government. You can perform a vital service to the nation by being in the forefront of the discussions on how the public sector can bring more effectively the enabling power of information technology to improve government operations and the delivery of services to the public.

NATIONAL ACADEMY OF PUBLIC ADMINISTRATION

As you know, the Academy is an independent, nonpartisan, nonprofit organization chartered by Congress to identify emerging issues of governance and provide practical assistance to federal, state, and local government on how to improve their performance. The views presented here are my own and not those of the Academy as an institution. However, they are based in part on work recently performed by Academy panels.

To carry out this mission, the Academy draws on the expertise of more than 400 Fellows, who include current and former members of Congress, cabinet secretaries, senior federal executives, state and local officials, business executives, scholars, and journalists. Our congressional charter is one of two granted to research organizations. The other charter is held by the National Academy of Sciences which specializes in scientific research. The Academy's emphasis is on public administration--the management of government operations.

The Academy undertakes assignments at the behest of Congress and executive agencies. Recent Academy work for Congress has included reviews of the Environmental Protection Agency, the capacity of governments at all levels to respond to disasters, the Smithsonian Institution, the Department of Housing and Urban Development, and the General Accounting Office.

The Academy has a long-standing commitment to improving government performance (see Appendix A) and has undertaken the design, installation and review of performance measurement systems, like those envisioned by the Government Performance and Results Act of 1993 (GPRA) and the Information Technology Management Reform Act of 1996. The Academy has also established two program areas, the Center for Information Management and the Program on Improving Government Performance, that provide leadership and expertise to federal agencies as well as state and local governments to improve their performance and reduce the costs of governing.

My presentation today will highlight key themes we identified through the Academy's research in information technology and performance based management, including a recent study for the Department of Defense that evaluated information management performance measures.

SUCCESSFUL USE OF INFORMATION TECHNOLOGY

OVERALL VIEW

The federal government has a mixed record in using and accounting for the use of information technology in its operations and in the provision of services to citizens. Clearly the Gulf War was made more successful by the military's use of computers and telecommunications to target weapons precisely, carry out complex logistical operations, and assess enemy locations and moves. Current and emerging government "virtual" capabilities increase daily, such as electronic commerce, online filing of income taxes, and World Wide Web information on many government agencies. The responsiveness and ease of access of these "virtual" capabilities will help build trust and credibility in our government as well as provide innovative delivery

mechanisms for government products and services. However, it is not unusual to read in the papers and trade journals of information technology projects which substantially overrun their budgets, are behind schedule and do not meet the promised expectations of performance. Government is not alone in this. Private-sector firms are also struggling with the great expectations and high costs of information technology. Both government and industry want to know clearly how information technology has helped achieve program results and added value to the organization. It may be that part of the problem in the public sector associated with information technology is the complexity of the client base or simply the scale of the mission. However, in a strategic sense, the problems stem from much more fundamental flaws: the failure or inability to: (1) match performance against promises; (2) procure and implement investments in technology in a reasonable timeframe; and (3) constantly refresh the people in government who acquire and use information technology. Fortunately, we can draw some important lessons on best practices from both private and public examples.

It is our conclusion that successful use of information technology requires three key areas of investment: performance measurement; organizational and investment strategies; and people.

PERFORMANCE MEASUREMENT

Increasingly, the measure of success for information technology is its performance, how well the technology supports and contributes to the success of the organization. This is easier said than done. To be meaningful, performance measures have to be developed in the context of the organization's goals, objectives, and priorities and integrated into the organization's management control processes. This is more of an art than a science. Development and use of performance measures require sustained commitment and leadership from the top management officials and buy-in from the stakeholders, both internal and external to the organization.

I recently chaired an Academy panel that provided an evaluation and recommendations for performance measures and management controls for the Department of Defense (DoD) administrative automated information systems. In our report, *Information Management*

Performance Measures, we recommended that DoD establish a performance framework—which is the integration of goal-setting, performance measurement and management controls—and a set of outcome-oriented performance measures. We also proposed a strategic roadmap of near-term and long-term actions to develop and implement a comprehensive performance framework for information management throughout the department. Together the framework and measures can be powerful and timely tools that can be used to assess how information technology is improving mission performance and reducing costs.

The key at DoD, as it certainly is in most organizations, is to find a set of measures of performance that has meaning both to the strategic objectives of an organization AND the individuals on the worksite or, in DoD's case, on the battlefield. The difficulty in creating such a set of measures is that they can instantly become so global as to be meaningless or so specific that there are simply too many to deal with in an effective manner. The answer lies somewhere in between.

Another key concern in developing the right set of measures is to constantly be wary of measures that are "count" focused. Accounting for the completion of a system may be an important measure of bureaucratic progress, but it says nothing as to overall strategic mission—the quality of a product, its usefulness, and expected results. In effect there needs to be a series or hierarchy of measures that tie the strategic objectives of an organization (the readiness of a soldier) to the more mundane but critical day-to-day outcomes of an organization (e.g., the decreasing lead times to supply or produce a key repair part). Only measuring the timeframes it takes to deliver a new system may say nothing about the true "outcome" of all that effort, e.g., soldier readiness or more error-free social security checks. The fact that the system was delivered—perhaps quicker—is not sufficient in itself. In the case of information technology investments, it is the results of the program which the technology enables that are the true performance outcomes.

Consequently, it is important to remember that performance measurement is just one tool in the management tool box. It needs to be used appropriately in the right context. It cannot be

viewed as a panacea or even a one-size-fits-all. Goals and related performance measures--and their level of detail and definition--have to reflect the relevant organizational level and the value to the accomplishment of the organizational mission. Value is a key concept, which demands additional considerations, in addition to the traditional cost-reduction targets. Value serves as a reality check on how performance measurement can be successfully implemented.

In the course of our panel's deliberations and in previous Academy work in reviewing the implementation of the pilot projects initiated under GPRA, we identified several factors critical to the successful development and use of performance measurement.

1. Top management must be involved and STAY involved from the development to the implementation of the measures until they are implemented in the organization's management control processes. This is not easy work. It is difficult to move an organization toward measuring both the tactical as well as the strategic. It takes time and constant vigilance. It takes flexibility and honesty to admit that sometimes the course is wrong and adjustments need to be made.
2. As I indicated earlier, performance measures must be developed in the context of goal-setting and management controls. Otherwise the measures are meaningless. They should not be developed or implemented as separate from ongoing business controls or management processes. Measures must be built into the mechanisms that the organization uses to perform its mission.
3. With regard to selecting measures, one should consider a vital-few generic measures such as reduction of cycle time, process/product improvement, cost-effectiveness and customer satisfaction. Such measures are outcome-oriented, quantifiable and can demonstrate value-added to the mission/program. While an organization should create strategic objectives and measures to indicate progress or lack thereof in achieving those objectives, there must be some connections to other outcomes for the tactical day-to-day work. In our report we proposed only nine key measures for DoD's expenditures and progress in

information technology. These are listed in Attachment B.

4. A balanced scorecard approach is useful in ensuring that key perspectives of the organization are reflected in the development of measures. In an excellent article in the January-February 1996 issue of the *Harvard Business Review*, Robert S. Kaplan and David P. Norton talk about the balanced scorecard approach in relation to the organization's strategic management system. They believe that a scorecard approach "addresses a serious deficiency in traditional management systems: their inability to link a company's long-term strategy with its short-term actions." Their findings reiterate what we have found: that most companies--and I would say most public entities as well--still emphasize short-term financial and operational measures without looking at appropriate linkages to the full range of an organization's strategic objectives. I will come back to this shortly.
5. The workforce must be educated and trained in performance measurement and information technology. Getting good people and keeping them up to date is essential.

I will comment more on this later.

ORGANIZATIONAL AND INVESTMENT STRATEGIES

These success factors also influence the second area of investment, which is the capital infrastructure. By this I mean the way the organization invests in itself to meet its various business objectives. Each organization has a set of business objectives it hopes to accomplish. For the private sector, one key objective is the "bottom line, or profit. However, even private sector firms realize that if the organization is only budget-driven, it can lose sight of other important business perspectives such as customer satisfaction and economic growth. This is captured in the concept of the balanced scorecard which I mentioned earlier. The concept was developed to help prevent a myopic view of what makes an organization successful by considering all critical areas. The areas can be defined differently depending on the

organization, but generally they would include:

1. A strategic perspective: how does information technology contribute to the accomplishment of the organization's overall mission and strategic goals? The IRS, for instance, in recent years has begun to develop the metrics on how investments in technology will increase the ability to fairly collect taxes—their basic strategic mission. While the tying of technology investments to increased revenue is controversial, as their metrics improve and their performance measures are linked to promises, the investment decisions should become clearer.
2. Internal business perspective: how well information products and services are functioning to improve performance of programs and/or reduce costs. In most cases, this is where the investment criteria have stuck for most public and many private entities. It is the efficiency argument and indeed it is a strong component of traditional cost/benefit studies for technology investments. It is a simple and straightforward approach: if we invest X million dollars in technology, we can eliminate X thousand people. One real issue regarding the impact of technology investments on improving performance usually relates to how well (or not so well) an organization has reexamined its business processes before they invest in new technology.
3. Customer perspective: how internal and external customers see information products and services. This arena is ripe for inventive work on the impact of technology. It is also a very difficult one to put a dollar value on. For instance, what is the value of investing in the digitizing of tax returns that will eliminate key-punch errors and therefore reduce the burden on the taxpayer in terms of rework or response to notices? What is the value of decreasing the time frame for a customer to obtain a service or produce from the government? Clearly it is of value but the valuation of that process improvement is a bit more difficult.

4. Innovation and learning perspective: do the design and application of information management initiatives foster increased innovation, learning, and workforce and organizational capacities?

Although we did not include this in our report, I would add a fifth perspective that looks externally: continued procurement reform, especially in the area of information management, now seems a possibility. In the implementation of that reform, I would suggest that government agencies must now draw upon the private sector in a variety of ways. First, consider using private sector experience in contract proposals not just government experience. Second, provide incentives—which I think will happen in any case through GSA schedules—for increasing the use of commercial-off-the-shelf systems. There is an inherent bias in government that government is so different no off-the-shelf system could possibly work in that operating environment. Third, consider more outsourcing as a solution to provide better information technology services to the government. Most federal agencies' core business is not information technology. A large federal entity, like a large private sector entity, cannot keep up with the rapid changes in technology and will find itself with employees whose talents are no longer current. Agencies, like successful private companies, need to focus on their core mission and let people whose business is technology run those investments. Hopefully, the procurement reforms will provide additional incentives, simplicity in the acquisition process and perhaps better price for the government. and

With this as a framework one can then explore what processes and structure(s) will be the most effective and efficient in meeting these priorities and what institutional constraints need to be addressed in order to accommodate those processes and structures. This will also serve as a more solid basis for identifying which processes need to be re-engineered in what timeframe, developing a cohesive strategy for the integration of old and new systems, and exploring alternative organizational structures, including options for outsourcing. For example, the Academy is now conducting a study for the Department of Commerce's National Ocean Service to design a new organizational form, such as a government corporation, for their geodesy and nautical charting services so they can move toward a digital capability to better meet their

customers' needs and keep up with what is happening in the private sector.

PEOPLE

The third area concerns the people in an organization. Performance measures provide managers with tools and a process to set standards and account for results. Disciplined organizational and investment strategies permit financial and program managers to deliberate on and select options to determine the best mix of systems and information infrastructures that an organization can pragmatically afford. Both of these aspects of information technology are crucial to providing results and accountability. However, equally important are the skills and abilities of the government people to redesign new processes and implement them using new automated information systems. The dedicated people who work for our government, not the policy or the technology, are the real reason government work gets done well. The professional health and vitality of the workforce are of critical importance to the successful use of information technology. And information technology demands a rigorous skill set that includes:

- The four C's: critical thinking, communications, collaboration, and computer literacy
- Business skills: project management; process improvement; basic finance and accounting; marketing; and economic analysis
- People skills: team building, entrepreneurship, and customer relations
- Outsourcing skills: what are the organization's core competencies; how does one evaluate the costs, consequences, and contributions of insiders and outsiders to come up with a best mix; and how do government managers use contract management skills to operate the mix.

In today's era of downsizing, innovative human resource management strategies are essential to

recruiting and retaining a high-quality workforce capable of meeting these new skill sets requirements and the uncertainty which the future brings. Managing change and downsizing, especially in the human resource area, requires careful planning and execution. Downsizing can be an effective management tool for restructuring and re-engineering organizations and can lead to reduced expenses, increased profitability, increased competitive advantage, and improved customer service. However, a lack of planning, managing, or monitoring of downsizing can be a recipe for disaster. Although government agencies face unique issues, valuable lessons can be learned from both public and private organizations that have undergone downsizing effectively.

The Academy, through its Center for Human Resources Management, recently completed a report, *Effective Downsizing: Lessons Learned for Government Organizations*, which has direct applicability in moving toward a quality workforce able to handle the uncertainty and complexity involved in developing and implementing large-scale information systems. Since the government's information technology workforce will be downsized due to budget cuts and privatization initiatives, it is important to be able to apply these lessons learned or "best practices" concurrently with improving the skills of the workforce remaining to do the job. Key lessons learned highlighted in the report are:

- Restructure the organization to reflect the changed mission, staffing levels, and performance expectations before determining staff reductions. Simply cutting staff will only leave fewer employees to do the same amount of work.
- Target separation incentives to organizations and occupations that will be downsized to minimize loss of skills in key mission areas that will carry on after the downsizing.
- Tap employee and union knowledge and involvement when planning and undertaking downsizing.

- Use involuntary separations (reductions-in-force) as necessary due to mission needs or timeframes, but only as a last resort.
- Address the needs of the affected employees, including those remaining, so that mission objectives and organization performance are achieved.

To be successful, downsizing must take into consideration the organization's mission, customers, culture, union environment, future workforce needs, current and future workforce skills and competencies, and current and target organizational structures.

CONCLUSION

Information technology can provide unprecedented opportunities for government to improve its operations and services for its citizens. At the same time, information technology needs to be held accountable in terms of dollars spent and results achieved. The successful use of information technology in government organizations requires three key components: (1) establishing program goals and performance measures; (2) developing new investment and organizational strategies; and (3) educating, training, and recognizing the people responsible for managing and overseeing government information systems and capabilities. Congress has a key role to play in managing these important investments.

Mr. Chairman, this concludes my prepared statement. I would be pleased to answer any questions.

APPENDIX A: NAPA'S COMMITMENT TO PERFORMANCE

Improving government performance is central to the Academy's mission as embodied in its congressional charter. The concept of performance-based public management has shaped activities of the Academy.

NAPA's 1980 book, *The Productivity Improvement Handbook for State and Local Government* (John Wiley and Sons), was the first major collection on performance based management programs at all levels of government.

NAPA was an early leader supporting the development of the Government Performance and Results Act. In 1991, the Academy adopted a resolution endorsing the key concepts embodied in the act, such as goal setting, performance monitoring and regular reporting. Academy Fellows Joseph S. Wholey, now at OMB where he is assisting with GPRA implementation, and Harry P. Hatry, director of state and local programs at the Urban Institute, both played key roles in the design of the legislation and continue to support its development in a variety of ways.

More recently the Academy has actively worked to support a performance oriented approach to the management of government. The NAPA Advisory Panel on Improving Government Performance, co-chaired by Harry Hatry and Harold B. Finger, has supported a variety of activities to assist in GPRA implementation. These have included formal testimony before Congress; informal guidance to the National Performance Review, Office of Management and Budget, and the General Accounting Office; and oversight of Academy contract work related to performance monitoring. The Panel produced a report on the early experience with GPRA implementation entitled, *Toward Useful Performance Measurement: Lessons Learned From Initial Pilot Performance Plans Prepared Under the Government Performance and Results Act* (1994). The Panel also sponsors a monthly Discussion Forum on Improving Government Performance to bring together people interested in the concept of performance monitoring and in the effective implementation of GPRA.

A variety of project based activity at NAPA focuses on improving government performance, as does its various program concentrations, including the Program on Improving Government Performance, Center for Information Resources Management, and Center for Human Resource Management, and Alliance for Redesigning Government.

APPENDIX B: PROPOSED PERFORMANCE MEASURES FOR INFORMATION MANAGEMENT FOR THE DEPARTMENT OF DEFENSE

1. Annual percentage and/or actual change in life cycle costs for existing systems (by individual system and/or functional area).
2. Percentage and/or actual change in functional work process cycle time (can be compared to a benchmark or baseline of existing performance).
3. Percentage and/or actual change in acquisition time to deliver an information management (IM) product or service (groups by like items, e.g., PCs, software programs, or communications equipment).
4. Change in percentage of functional products/services quality (e.g., few defects in terms of error rates, transaction "redos," duplicate or missing payments, system down time).
5. Change in percentage of major automated information system (MAIS) projects that are on schedule, are within budget, and achieve expected results/benefits.
6. Change in percentage of major automated information system (MAIS) projects that are on schedule, are within budget, and achieve expected results/benefits.
7. Change in percentage of MAIS that comply with DoD standards and architectures. Specifically, increase in MAIS that comply with technical infrastructure guidelines and standards for (initially): a) operating systems; b) communications protocols; and c) database management systems. Measures should be developed eventually for interoperability and security.
8. At a minimum, a) each BPR activity or project and b) each MAIS should be supported by a return on investment (ROI) analysis which provides input to the decision whether to proceed. The ROI should be updated periodically to ascertain if in fact the reengineering effort resulted in the predicted ROI.
9. Percentage of MAIS program/project management staffs which meet DoD acquisition and information management education and training requirements. A measure should be developed eventually that will indicate the degree to which the information management workforce meets the knowledge and skill requirements (technical and managerial) as determined by DoD.

Source: National Academy of Public Administration report, *Information Management Performance Measures*, Washington, D.C. 1996.

Mr. HORN. Thank you for that very helpful statement.

We will now call on Mr. John M. Kost, the chief information officer for the State of Michigan. I might say, Mr. Kost, we were very impressed by Governor Engler's state of the State address, which was carried on C-SPAN. I thought there was a lot of wisdom in what he had to say.

I think you know that most of the Members of the majority in this Congress are great fans of Governor Engler, and we particularly appreciate when he made the tough decisions, as I recall his popularity went down to 15 or 19 percent, and he won his election by 74 percent after that popularity. We look to him as an inspiration and a role model. So, thank you for coming.

Mr. KOST. Thank you. I will be sure to pass that along. I am going to talk briefly today about management responsiveness to technology. Governor Engler has gotten a lot of acknowledgment around the country for areas that are very visible, in welfare reform, tax reform and education reform. What is seldom known, though, outside of the halls of Government is what he has done in reform of how Government operates. I am going to talk a little bit about that today.

His basic complaint to me, and I have worked for him for some time now, was that technology in Government was unresponsive to policy needs and to its customers, and he wanted government management solutions to solve those problems. I should point out I am not a techy. I have been his troubleshooter for some time, but my role is to reform the management of Government. I will try to do a high-tech show, so I apologize for not having the paper.

When we started in 1992 we inherited an old paradigm for technology management that looked a little like this. The blue column—the Y axis is time and energy that agencies devote to these particular activities. The bar on the left is mainframes and wide area networks. The green column on the right is desktop computing, the microtech support activities, and the one in the middle is application development and customer service types of applications.

There was a terrible dysfunction in that so what we tried to do when I became CIO was to change the dynamics of this, to shrink the blue column dramatically so that mainframes and wide area networks became a utility that agencies buy. They pay for what they use, buy only what they need, but they don't have to worry about supporting it anymore. The green column we have outsourced. EDS is our outsourcing company. They handle all of our desktop acquisitions, installation, maintenance, training, and software development for PC's.

We are trying to shift the emphasis for our agencies to the middle column so they spend more time thinking about how they serve their customers and what it is that they are doing rather than focusing on supporting bits and bites. We started with a number of very significant problems and challenges, organizational barriers first amongst them. That is the hardest. Technology is not the hardest problem. It is the organizational problems. It was an issue of agencies versus Statewide integration.

Agencies saw themselves as stovepipes. "You don't want to talk to me if you are not part of my agency." If you are a customer of that agency, you are only served by the technology they can bring

to bear on you. You as a customer or citizen of the State or of the country should not have to care what bureaucracy is supposed to take care of you. You want your problems solved and service needs met. They shouldn't have to care about those, and our technologies should be responsive no matter what door they walk in.

Second, we have a series of process barriers, and my guess is that these are even more significant at the Federal level. Typically, processes regulate; they do not serve. Most are designed to prevent rather than to facilitate. In the technology area, in particular, the purchasing process, for example, is one that prevents Government from keeping up. We in Michigan recognize that time is money, and we have a purchasing process that reflects it and I will talk a bit more about that in a moment.

Finally, the technology barriers. We had too many decisions made by technology people rather than policy people or managers. The technology was basically seen as toys that our data center managers bought. It was the way for them to enhance their capabilities, but they weren't sure what was needed by their customers. So we have begun to shift that. There was too little understanding of the importance of the tools in getting the job done.

We have a number of critical success factors that we think are essential going beyond or perhaps broader than some of the previous folks who testified, which I fully agree with. Leadership is a key. We have a CEO, a Governor who is very much involved, and who cares about these things. We have a CIO, me, in whom he has invested considerable authority.

I have very broad authority, even though I am not a cabinet member, to go in and manage technology, to make sure that agencies are doing what they should be doing and not relying on their own independent status to do what they want to do. We have heavy reliance on enterprise instead of simply vertical integration. We want our agencies to work together, to share data, to share applications where it is appropriate. We focus heavily on outcomes instead of processes. We have a purchasing process that is extremely flexible. We focus not on the process of buying stuff, but on what is the outcome, and sometimes the process will make people a little squeamish.

We have enterprise-wide standardization, increasingly. We have tremendous process reforms underway, personnel management changes that provide more flexibility and enhanced skills and a dramatic change in how we do financial management in State government.

We have a number of specific solutions. I will run through them quickly. CEO leadership. There is no question that having the CEO actively involved is imperative, heavily empowered CIO, services that are customer-driven, utility services that agencies buy rather than having to build and support their own, Statewide standards, revolving fund. This is something of some interest to perhaps a legislative body. I don't go to the appropriations committees ever or the legislature. My customers buy services from me. I charge them for what I provide, but I use revolving funds to buy the technology we need.

And we have a very responsive procurement process. I have a slide here that I use in my procurement speeches to compare how

Government and business work in the procurement area. I don't have time to get into that, but I would point out a handout that I believe I shared with members of the committee. This one page is our entire purchasing law and there are no administrative rules. And one part in particular says, the department, meaning my department, shall utilize competitive bidding for all purchases authorized pursuant to this section unless the department has determined, "that another procurement method is in the State's best interest."

I am the one who gets to make the decision when that is true. So when we make a decision we need something, we simply go out and get it. We figure out what is the best way to do it. If it is no bid, if it is sole source we go do it.

I should also point out, we don't have an appeals or protest process. We don't allow them. You want to do business with Michigan, you play by our rules. By the way, we set up each particular procurement. That can be controversial, but it has worked and we have not been sued or had any political problems as a result.

I have a pyramid here, key elements that we build on. Customers are the base. That is who we work toward. Line agencies are the front end. They have to be served. But the processes are imperative. You have to look at the processes to make sure they are accomplishing what you intend to accomplish, provide utility services so agencies don't have to do it on their own, and you need strong leadership and management.

In closing, there is no question that the role and the value of information technology in Government are growing. The management of how we handle that information technology has to change. The traditional hierarchical management structures of Government do not fit in management of technology in this decade. The culture and processes must change. It doesn't matter if you have the best technology in the world, if you can't buy it, or you can't buy the right thing, or you have the wrong culture to manage it properly, it isn't going to work. You have to focus on the customer, not simply on the technology for the sake of technology. And there is one phrase we don't allow in State government anymore.

That is my testimony.

[Note.—The bar graphs referred to can be found in subcommittee files.]

Mr. HORN. Thank you very much for that most helpful testimony that gives us some good guidance. I wish our laws could be as simple as your laws. I have tried communicating in plain English, and they say, no, you can't do that. You have to have the legislative counsel rewrite it. They are wonderful people. They have been here 30 years and know what they are doing, but they write it in legalese. There is no reason why we couldn't put laws in simple English. We should do more of it.

Our last presenter on this panel is Mr. David R. Brooks, the deputy sector vice president for health care technology sector at Science Applications International Corp. Welcome.

Mr. BROOKS. Mr. Chairman and members of the committee, for today's hearing on information technology best practices I would like to share with this committee my perspective on how Government can better manage cost-effective advanced information tech-

nology to ensure mission success. A key example that illustrates the implementation of SAIC's best practices in information technology is our experience with the Department of Defense Office of Health Affairs with its primary medical information system, Composite Health Care System, CHCS.

CHCS supports 9 million beneficiaries in 600 hospitals and clinics worldwide, including support of about 140,000 caregivers and support people. CHCS was and is intended to serve the health care information needs of all three military services, each with diverse peacetime and wartime requirements, and sometimes different approaches to information systems.

To effectively manage this complex program, identifying and resolving the inevitable problems that would occur with large-scale systems engineering, software development, testing, deployment, implementation and customer support, we knew we had to be able to respond effectively to change.

DOD built a strong program office. We built a strong program office and co-located with DOD in Falls Church, VA. DOD and SAIC then used an incremental approach to systems development and requirements definition. We proactively solicited input from users and designed integrated hardware and software architecture that is fully scalable to support the full range of DOD medical facilities from small clinics to large regional facilities. We developed a system less than absolutely perfect, but one which would deliver the promised return on investment on time.

Over the years, as hardware and communications systems technically improved and the health care world transitioned to what is now known as managed care, SAIC evolved CHCS with upgrades that resulted in significant savings and increased computer performance, and CHCS not only truly revolutionized military health care, but the system was delivered on time and under budget, even though system requirements were increased to address multiple changes in the health care delivery environment. The benefits delivered are more than \$1.40 for each dollar invested. That is more than \$800 million of net benefit to the Government.

I believe that much of the success of CHCS is tied to SAIC's commitment to several critical factors in long-term complex information technology projects.

I will note five factors and give some examples. It is important, first, to maintain disciplined processes for strategic planning and identifying evolving customers' needs and mission goals of the system. Second, establish an integrated program team that works in partnership with the customer to effectively coordinate actions needed. Third, manage the information system project as a investment in two ways; by evaluating the benefits, risks and budget tradeoffs of key decisions throughout the project life cycle, and by investing in process enhancements and tools.

Fourth, systematically measure all key process performance indicators and track process improvement.

Fifth, use a systems approach to manage fiscal and technical management while accommodating evolutionary changes over the project's life cycle.

Examples of CHCS program management and best practices can be illustrated in the two exhibits on pages 5 and 6 of the handout.

The first exhibit shows how DOD and SAIC built upon technology advances and cost performance improvements in computer hardware and data storage technology by developing an extensible architecture. Through this evolution operating systems and communications architectures were implemented to support changing and increasingly more complex customer requirements.

Eight years ago we could not have accurately predicted advances in technology and changes in user requirements, but we integrated the planning, budgeting and evaluation processes to ensure implementation of system improvements and optimal technology as it became available and as requirements were refined. A strong operational test and evaluation team enabled us to identify and correct problems in a controlled system test environment before releasing software to sites.

The second exhibit shows CHCS improvements as measured over several years by key process indicators. These process indicators are linked to outcomes metrics that are tracked by DOD. So other panelists have talked about outcomes measures. DOD tracked them. Then jointly with DOD we tracked process metrics that showed how we would deliver the outcomes.

In 1992-93 we engaged in discussions with the Government to identify no more than 12 to 15 measures of program maturity and success. We then started collecting data on the mutually agreed upon measures. This allowed us to identify process weaknesses and break downs that were impeding a better, faster, cheaper outcome in all aspects of the program. We believe in the old maxim, if you can't measure it you can't manage it. We also believe that continuous process improvement and a regular practice of examining lessons learned systematically applied over the course of several years can lead to substantial improvements in effectiveness.

Software development is achieved through processes that can be objectively improved to higher levels of maturity; that is to say lower error rates and higher repeatability of success. Lower error rates means less rework, fewer delays, less cost and fewer surprises. This also improves customer satisfaction. In the same fashion, we started measuring key indicators of customer support processes. The system now runs faster, is available for use 99.7 percent of the time, and costs much less per site or per user. The paradox that better and faster can also be cheaper is truly illustrated by this data.

In conclusion, flexible and effective management of CHCS by DOD and SAIC has delivered more than promised on time and under budget.

[The prepared statement of Mr. Brooks follows:]

Statement of David R. Brooks

Mr. Chairman and Members of the Committee:

I am Dave Brooks, Deputy Sector Vice President for the Health Care Technology Sector at Science Applications International Corporation (SAIC), which is headquartered in La Jolla, California. I am pleased to be here today to represent SAIC, the world's largest employee-owned advanced technology company. SAIC designs information technology solutions to help its customers accommodate change and succeed in their competitive environments. Strategic systems integration has been one of SAIC's strengths for more than 27 years. As a result, independent surveys have ranked SAIC among the top information technology companies in the world. SAIC now has 21,000 employees worldwide serving customers in a wide range of industries including health care, transportation, the environment, banking, national security, communications, and energy.

For today's hearing on Information Technology Best Practices, I would like to share with this Committee my perspective on how the government can make better use of cost-efficient advanced information technology to ensure mission success. A key example that illustrates the implementation of SAIC's best practices in information technology is our experience with the Department of Defense (DoD), Office of Health Affairs. SAIC was selected in 1988 as the prime contractor by Health Affairs to develop, deploy, operate, and maintain its primary medical information system, called the Composite Health Care System (CHCS). Under our 8-year contract with DoD, we worked in partnership with DoD to design and implement this clinical and administrative system that now serves over 9 million active beneficiaries at 575 Medical Treatment Facilities worldwide.

The Composite Health Care System was and is intended to serve the health care information needs of all three military services, each with diverse peacetime and wartime requirements and sometimes differing approaches to information systems. After winning the competitively procured CHCS contract, SAIC and DoD initiated formal and disciplined processes to bring decision-

makers together for system planning and requirements definition. In particular, we developed collaborative relationships with our customer. Our corporate culture emphasizes the importance of defining customer satisfaction with the customer and then to practice it every day for the life of the contract.

To effectively manage this complex program meant recognizing that we needed to identify and resolve the inevitable problems that would occur with large-scale systems engineering, software development, testing, deployment, implementation, and customer support. We knew we had to be able to respond rapidly to change. DoD built a strong program office. We built a strong program office and collocated with DoD in Falls Church, Virginia. DoD and SAIC then used an incremental approach to system development and requirements definition. We proactively solicited input from the user community and designed the technical approach to provide an integrated hardware and software architecture that is fully scalable to support the vast range of DoD medical facilities, from small clinics to large regional facilities.

Over the years, as the hardware and communication systems technically improved, and the health care world transitioned to what is now known as managed care, SAIC evolved the CHCS system with upgrades that resulted in significant savings and increased computer performance. Pharmacy waiting time was drastically reduced. Physicians were able to get all the information they needed electronically in the medical clinics and hospital environments to make the most informed decisions possible. Patient appointments were greatly increased in number because of this improved system automation. And CHCS not only truly revolutionized military health care, but the system was delivered on time and under budget, even though the system requirements were increased to address multiple changes in the health care delivery environment. The benefit-to-cost ratio for CHCS is over 1.4, as assessed by DoD, which indicates that this investment has resulted in substantial benefits realization now valued at more than \$2.8 billion for the 10 year life cycle period.

I believe that much of the success of CHCS is tied to SAIC's commitment to several critical factors in long-term, complex

information technology projects. I would like to explain these five factors and give some examples. It is important to:

- First, maintain disciplined processes for strategic planning and identifying evolving customer needs and mission goals of the system
- Second, establish an integrated program team that works in partnership with the customer and other contractors to effectively coordinate actions needed
- Third, manage the information system project as an investment in two ways: first, by evaluating the benefits, risks and budget trade-offs of key decisions throughout the project life cycle; and second by investing in process enhancements and tools
- Fourth, systematically measure all key process performance indicators and track process improvement,
- Fifth, use a systems approach to maintain fiscal and technical management while accommodating evolutionary changes over the project's life cycle.

Examples of the CHCS program management and best practices can be illustrated in the two exhibits on the following pages. The first exhibit shows how DoD and SAIC built upon technology advances and cost/performance improvements in computer hardware and data storage technologies by developing an extensible architecture. Through this evolution, the operating systems and communications architectures were implemented to support changing and increasingly more complex customer requirements. Eight years ago, we could not have accurately predicted these advances in technology and changes in requirements. But we integrated the planning, budgeting, and evaluation processes to ensure implementation of system improvements and optimal technology as it became available, and as requirements were refined. A strong operational test and evaluation team of both SAIC and government professionals enabled us to identify and correct problems in a controlled system test environment before releasing software to the sites.

The second exhibit shows CHCS improvements, as measured over several years by key process indicators. In 1992-93, we

	1988	1989	1990	1991	1992	1993	1994	1995	1996
DoD Operating Environ.	IP Vol = \$0 mil OP Vol = \$1 mil OP Cost = \$1 mil 9 mil beneficiaries	IP Vol = \$4 mil IP Cost = \$4 mil OP Vol = \$2 mil OP Cost = \$4 mil 9 mil beneficiaries	IP Vol = \$2 mil IP Cost = \$2 mil OP Vol = \$4 mil OP Cost = \$4 mil 9 mil beneficiaries	IP Vol = \$4 mil IP Cost = \$4 mil OP Vol = \$6 mil OP Cost = \$4 mil 9 mil beneficiaries	IP Vol = \$3.8 mil IP Cost = \$3.8 mil OP Vol = \$5 mil OP Cost = \$3.8 mil 9 mil beneficiaries	IP Vol = \$3.0 mil IP Cost = \$3.0 mil OP Vol = \$7 mil OP Cost = \$3.0 mil 9 mil beneficiaries	IP Vol = \$2.3 mil IP Cost = \$2.3 mil OP Vol = \$7 mil OP Cost = \$2.3 mil 9 mil beneficiaries	IP Vol = \$2.1 mil IP Cost = \$2.1 mil OP Vol = \$6 mil OP Cost = \$2.1 mil 9 mil beneficiaries	IP Vol = \$2.0 mil IP Cost = \$2.0 mil OP Vol = \$5 mil OP Cost = \$2.0 mil 9 mil beneficiaries
CONOPS	Separate Services Separate Facilities Total Int. System	Unified Service Int. Hosp & Clinic Total Int. System Stand Alone PAS	Unified Service Int. Hosp & Clinic Total Int. System Stand Alone PAS	Unified Service Private Partners Int. Hosp & Clinic Int. OP System Stand Alone PAS	Unified Service Private Partners Int. Hosp & Clinic Int. OP System Stand Alone PAS	Unified Service w/ Private Partners Int. Hosp & Clinic Int. Regions COTS Integration EISDSS = CEIS I&I Laboratory PACMEDNET BS2000	Unified Service w/ Private Partners Int. Hosp & Clinic Int. Regions COTS Integration EISDSS = CEIS I&I Laboratory PACMEDNET BS2000	Unified Service w/ Private Partners Int. Hosp & Clinic Int. Regions COTS Integration EISDSS = CEIS I&I Laboratory PACMEDNET BS2000	Unified Service w/ Private Partners Int. Hosp & Clinic Int. Regions COTS Integration EISDSS = CEIS I&I Laboratory PACMEDNET BS2000
Hardware	VAX 8500 VAX 3000	VAX 8500 VAX 3000	VAX 6000 VAX 3000	VAX 6000 VAX 4000 VAX 3000	VAX 6000 VAX 4000 VAX 3000	VAX 8000 Alpha 200 Alpha 400 Intel 486	VAX 8000 Alpha 200 Alpha 400 Intel 486	VAX 8000 Alpha 200 Alpha 400 Intel 486	Alpha 8400 Alpha 200 Alpha 400 Intel 486 (Phasout)
Operating System	VMS DSM	VMS DSM	VMS DSM	VMS DSM	VMS DSM	VMS DSM MSM UNIX	VMS DSM MSM UNIX	VMS DSM MSM UNIX	OS/2 VMS MSM MSK (Phasout)
Comm. Architecture	Coax LAN Star MUX Network	Coax LAN Star MUX Network	Coax LAN Star MUX Network	Ethernet LAN Coax LAN Star MUX Network DECNET/LAT	Ethernet LAN Coax LAN Star MUX Network DECNET/LAT	Ethernet/CTrip LAN DECNET/LAN DECNET/LAT DISK WAN FDDI	Ethernet/CTrip LAN DECNET/LAN DECNET/LAT DISK WAN FDDI	Ethernet/CTrip LAN DECNET/LAT DECNET/LAT DISK WAN FDDI	Ethernet/CTrip LAN DECNET/LAT DECNET/LAT DISK WAN FDDI
Deployed Facilities	15	70	130	190	190	250	375	575	650
Users	7,000	20,000	30,000	50,000	50,000	70,000	80,000	100,000	140,000
Bricklayers 3	5 m	1 m	1.3 m	2.5 m	2.5 m	4 m	8 m	7.5 m	9 m

CHCS Improvements

	Actuals					Goal
	92	93	94	95	96	
Development						
SEI Maturity Level	1	2	2	2	3	
Errors/KSLOC	7	4	1.5	2	1	
Cycle Time/700 KSLOC (Months)	30	24	13	14	12	
Cost/KSLOC	\$63K	\$50K	\$28K	\$14K	\$12K	
Customer Satisfaction (1 out of 10)	5	6	7	8	8	
Customer Service & Support						
Sites Deployed to Date	190	250	375	575	650	
O&M Cost/Month/Site	\$75K	\$65K	\$40K	\$20K	\$12K	
10 Year Life Cycle System Cost (500 User System)	\$3,950K	\$3,950K	\$2,400K	\$1,900K	\$1,600K	
People Trained to Date	50K	70K	90K	120K	140K	
Performance (Target ≤ 1)	1.5	.9	.8	.8	.8	
Availability	96%	98%	99.5%	99.7%	99.8%	
Customer Satisfaction (1 out of 10)	7	9	9	9	9	
Overall Customer Benefit						
Total Contract Cost (ETC)	\$1000M	\$1000M	\$1000M	\$1000M	\$1000M	

engaged in discussions with the government to identify no more than 12 to 15 measures of program maturity and success. We then started collecting data on the mutually agreed upon measures. This allowed us to identify process weaknesses and breakdowns that were impeding a "better, faster, cheaper" outcome in all aspects of the program. We believe in the old maxim, "If you can't measure it, you can't manage it." We also believe that continuous process improvement and a regular practice of examining "lessons learned," systematically applied over the course of several years, can lead to substantial improvement in effectiveness.

Software development is achieved through processes that can be objectively improved to higher levels of maturity; that is to say, lower error rates and higher repeatability of success. Lower error rates mean less rework, fewer delays, less cost, and fewer surprises. This also improves customer satisfaction. In the same fashion, we started measuring key indicators of customer support processes. The system now runs faster, is available for use 99.7 percent of the time, and costs much less per site or per user. The paradox that better and faster can also be cheaper is truly illustrated by this data.

In conclusion, CHCS has truly been a best value procurement for the military and the government. CHCS is now being interfaced with other federal health care systems such as the Department of Veterans Affairs' Decentralized Hospital Computer Program. Building upon the CHCS program, the military has been prototyping a transportable computerized patient record that can move patient data from facility to facility across vast regions of the Pacific. This advanced technology is also going to be used to provide state-of-the-art health care for our forces in Bosnia participating in Operation Joint Endeavor. These follow-on advances will continue to make CHCS a success story in the next century.

There is so much more that I can tell you about CHCS and SAIC's efforts, though my time is up. I would be happy to answer any questions that you may have at this time.

Introducing the Composite Health Care System

The Future of Military Health Care Is Now

Science Applications International Corporation (SAIC) has designed, developed, and implemented a medical information management system for the Department of Defense (DoD). This Composite Health Care System (CHCS) is a fully integrated hospital information system that connects medical departments, hospital wards, outlying clinics, laboratories, and pharmacies, integrating their information with computerized patient files. The result? Up-to-the-minute patient information that's just a computer keystroke away.

CHCS will serve more than 9 million beneficiaries of U.S. military health care worldwide. From Tripler Army Medical Center in Honolulu, Hawaii, to the USA 98th Hospital in Nuremberg, Germany, CHCS will be installed in more than 700 DoD hospitals and clinics providing health care to the men and women of the armed services and their dependents, veterans, and the retired military community.

Overall, CHCS means shorter waits for patients, faster reporting of diagnostic test results, improved use of medical and professional resources, and a significant improvement in the quality of patient care.

Modular and Flexible

The integrated, modular program design of CHCS allows the system to be expanded as a facilities requirements increase. CHCS automates data related to inpatient and outpatient care in the following areas:

- Patient administration and managed care enrollment
- Appointment scheduling
- Specialist referral management
- Provider network management
- Physician and nursing patient exams
- Computerized lab and radiology results
- Computerized pharmacy and dietetics
- Electronic mail staff message network
- Management and administration reports.

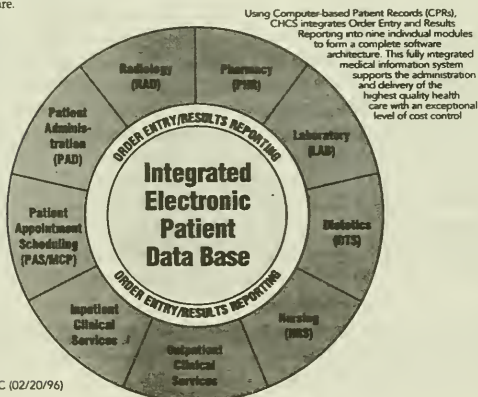
CHCS can be easily customized to meet specific hospital or departmental needs. Still, despite its comprehensive nature, the system has proved easy for staff to learn and use to improve patient care.

Tomorrow's Solutions Are Working Today

CHCS is in place in military treatment facilities around the world, and there has been substantial positive feedback from military health care providers and their patients about the timesaving and quality care benefits of the CHCS medical information management system.

From streamlining patient appointment bookings and hospital admissions to simplifying access to patient laboratory test results to speeding up the filling of prescriptions—this comprehensive computer system is improving health care for DoD beneficiaries.

Here is an overview of the numerous benefits that have been documented since CHCS was tested and approved by DoD.



CHCS assures quality of care around the world: easy access for patients and providers, better data management, and lower costs.

Introducing the Composite Health Care System

Benefits to Medical Professionals

CHCS saves staff time and increases job performance and satisfaction.

- Results Retrieval is the outstanding timesaving benefit for physicians and staff. Immediate notification of results to physicians assists in critical decisionmaking.
- Improved drug inventories help pharmacies monitor shelf life and quantities.
- Reduced paperwork due to automation and electronic storage allows staff more time to concentrate on the real work of providing health care.
- Improved accuracy of laboratory results and expedited radiology procedures through integration and the interface between the Kurzweil Radiology System and CHCS.
- Improved quality control reduces transcription errors. Accurate work load reporting is faster and easier, saving staff time.
- Improved productivity and utilization management through Ad Hoc Reports and utilization review.
- Improved communication through e-mail eliminates time wasted in telephone tag.
- Improved clinic administration with work load reporting and end-of-day and end-of-month processing.
- Improved documentation and accountability with increased documentation of patient's medication orders.
- Improved scheduling reduces errors and more effectively assigns staff resources to the benefit of patients and professionals.
- Systematic tracking of a patient's treatment course provides an audit trail that reduces duplication of services and lost test results.

Cost Benefits of Information Management

CHCS reduces costs by eliminating duplication and tracking of data to assist in determining the most successful medical strategies.

- Immediately accessible information permits the assessment of the cost effectiveness of resources used by providers.
- Systematic tracking of patients' treatment courses reduces the incidence of duplicate services resulting from misplaced orders or test results.
- Treatment patterns may be compared by providers to determine the most successful and cost-effective clinical protocols.
- Improved data collection for outcomes measurement, including the ability to conduct outcomes research on a large population, provides health care professionals with reliable treatment information.

Benefits to Patients

CHCS increases quality through complete, accurate, secure information about patients and their care.

- Immediate access to and secure maintenance of private personal medical records for authorized users facilitates appropriate patient care and *saves lives in emergency situations*.
- Increased access to care through better scheduling and resource utilization.
- Fewer repeated tests and examinations result from improved reporting and data management.
- Improved patient appointment scheduling and reduced overbooking allows patients to spend less time on the phone and in clinics.
- Improved health care professional/patient relationships because providers have more time for consultation.
- Improved drug inventories and decreased pharmacy wait time through Physician Order Entry, which allows prescriptions to be ready and waiting for the patient. CHCS telephone refill services save time for patients and pharmacy staff.
- Faster patient processing for radiology and lab work shortens waits for patients in scheduling tests and retrieving results.
- Current, accurate patient registration information is assured because records are constantly updated with patient treatment and address information.
- Greater patient satisfaction with results due to increased information on potential outcomes as well as timely treatment and prescriptions.



Mr. HORN. That is a very interesting story and I am delighted that you brought that out. I will now yield to Mr. Davis, the gentleman from Virginia, to question the various witnesses.

Mr. DAVIS. Thank you. Let me say, Mr. Brooks, SAIC we are proud to have as a greater presence in Virginia than in San Diego, so we claim you as our own even though your headquarters stays in San Diego.

You said in your testimony that you believe in the old maxim that if you can't measure it you can't manage it. What indicators do you find are the most useful in trying to measure?

Mr. BROOKS. I think on exhibit 2 in the handout are some of the keys that are worth a little bit of explanation. SEI is shorthand for the Software Engineering Institute affiliated with Carnegie Mellon University. They have an external benchmarking process that characterizes software development process maturity. We have been on a 3-year journey trying to take our process from level 1 to level 3. It looks at how well we plan, it looks at our error rate, how much rework we have, how much our cycle time is for major software builds, the cost for developing a thousand lines of code, and finally at customer satisfaction. We measure all of those, keep track, review them on a monthly basis and a quarterly basis, and inevitably every one of them yields to identification of process breakdowns and the kind of errors that only create delays, surprises and rework.

Mr. DAVIS. I was a senior vice president of PRC before elected here, one of your competitors. New information systems regularly experienced development delays, not just in the Federal Government, but in the private sector as well. When system developers fail to meet deadlines, what questions should be asked to determine is a project fatally flawed or only having a temporary delay?

We will start with Mr. Brooks and Mr. Kost maybe has an example of that, too. What questions do you ask, is this fatally flawed or are we only having a temporary delay? How do you bear with it? Any advice you can give us on that?

Mr. BROOKS. The first thing that I want to look at is a program plan that is firmly embedded in requirements definition that are realistic and doable. I think requirements creep or a lack of leadership by senior decisionmakers in the customer organization is one of the commonest pitfalls. Developers start developing before they know what it is they are developing. I think a rigorous requirements definition and systems and software engineering cycle at the beginning of the development process is a very effective investment of time and energy.

Mr. DAVIS. That requirements definition is critical because sometimes sides are really not talking to each other in terms of what they want. We have gone off on some tangents thinking we were giving the customer exactly what they wanted, and it turned out either the requirements change or it wasn't articulated upfront. You think that is the best thing—

Mr. BROOKS. That is the first place to look.

Mr. KINGHORN. In the testimony I gave, I mean the issues between the program officials who should be defining the requirements, it is nearly impossible in the Federal environment or very difficult to say enough is enough, we are going to freeze these re-

quirements. So I would second that. The other issue that you can ask if you don't already know it is when there is a serious issue on delays, ask in a room who is in charge. If the fingers start pointing, you know you have a more fundamental problem that all the requirements analysis in the first place isn't going to solve. I think you will see a lot of fingers pointing. That is one of the problems, is the definition of who is in charge and who is responsible to deliver certain things that they will be held accountable for.

Mr. DAVIS. And what we are delivering. We are not sure what we want, but—

Mr. KINGHORN. If you are not sure what you want, you are never going to know you have delivered it. The sad thing is you may have delivered it. No one knows.

Mr. KOST. That comes right back to the point I was making, one of my five success factors is leadership. You have to say who is in charge? Whose career is riding on this baby? That is No. 1, but second, if you haven't built it internally before, don't do it this time either. Get help. We not only outsourced a lot of that stuff which you may feel one way or another about, we rely heavily on quality assurance contractors to monitor progress, particularly in large systems development projects, to make sure that based on their experience perhaps in other jurisdictions or in the private sector, they have a way to benchmark much better than we do because typically in State government, perhaps in the Federal Government, one of these big projects is a career and you don't do more than one. Therefore, it is putting a lot of burden on you to do it right the first time. So if you can rely on the expertise and outside guidance of somebody who has done it before, it is very useful to have that sort of guidance in the process.

Mr. DAVIS. How do you write in the technological upgrades that are going to be needed with the changes in technology and information? Once it is established it can be obsolete in a couple of years sometimes. How do you write those in?

Mr. KOST. First of all, part of the reason that obsolescence occurs so readily in Government is that the purchasing process is such that you have to start over. We don't have that problem. If something is new and improved today, we get it today if that is when we need it. That is solution No. 1.

But second, when we do a competitive bid, we try to scale back the degree to which we are specific in our specifications. Our preference is rather than defining the solution to define the problem and let the vendors propose a solution or a series of solutions, and typically we always ask for technology refreshment in those solutions to build that into the long-term systems integration deal.

Mr. DAVIS. One of our problems has been in Government many times is we aren't sure of what we want. We ask for it and ask for upgrades along the way, and the bids that come in are for one set of solutions under one set of technology. By the time they are ready to go, they are obsolete and how do you start again? The people delivering the service might not have been cheaper for what is actually delivered.

Mr. KINGHORN. Just before I left IRS, I visited the California Franchise Tax Board because they basically came up with a new process, I think they called it open procurement, which mirrors

some of the things here. What they did, when they designed their new revenue system for the State of California was basically to have the ability to, in effect, have conversations with whichever bidders they wished.

Part of the problem is people in designing systems in the public sector and probably in the private sector aren't quite sure either what they want or what is really possible out there. So what happens is you build a perfect world and find out 6 years later you are the beta test for that perfect world.

What they did in California is, both the contractors they spoke to as well as their own experts, knew what they wanted and there was a conversation back and forth between the contractors and the client. When they picked a final procurement they had a pretty good understanding in the State of California of what was possible, what could be pushed and what to stay away from. That may be what they are doing in Michigan, but I think that would help in the Federal Government also.

Mr. KOST. There is one other advantage I might point out in having a more flexible procurement process. If you are taking a large project, and if you can break it into bite-sized pieces where you can take small successes and build on them without having to compete each succeeding phase, you can start smaller and then build on those and know that you are going to make progress. There is all the incentive in the world to make progress because the deliverables are very easily measured when you do it that way. That presumes that you don't have to compete each successive phase, which we in Michigan don't.

Mr. DI PENTIMA. And that is one of the fundamental problems that you face. Right now the technology cycle is shorter than the procurement cycle, so the thing that you set out to buy today in government is already out of date when the contract is delivered. I think you are saying exactly the right thing, John.

The problem is for the program manager—I wasn't about to go through three of these large things at 2 years apiece. So you try to bundle it all together, which is mistake No. 1, which you hardly survive. So the ability to build a little, field a little, learn, build some more, field some more, learn, that is the right way to do it. The Government procurement process hasn't allowed that.

Mr. DAVIS. In the new procurement bill which emanated from here, we put that provision in. We are going to revisit that bill, I think, every session, come back and upgrade. We are not going to do these 10-year increments on procurement, and hear from the industry and customers and the Government and the people who are getting the benefit and try to review this.

But your comments are very important today. I yield back.

Mr. BROOKS. I would like to make one more reinforcing comment. CHCS was awarded as an 8-year big bang program and early on the Government and SAIC recognized that was not a managerially wise approach. So we negotiated a different management arrangement on the contract, so that we ended up rebaselining requirements four times in 8 years, and we ended up with annual new technology insertion cycles, and only through those two degrees of flexibility could we have the success that we achieved.

Mr. DAVIS. Thank you very much.

Mr. HORN. I thank the gentleman. Before I get into the general questions on information technology, when I have got an expert like Dr. Di Pentima here, I want to ask you a couple of questions about Social Security; not when I am eligible for it, but 30 years ago when I was on the Senate side as a senior staff member, there is no question Social Security had the finest reputation in Washington in terms of its congressional responsiveness. They were very good about liaisoning with us.

I have been intrigued. That is the largest volume of people involved in any Government agency but the Post Office—what interests me is how we account for the credibility of their Social Security cards, which is a management information problem, and I am just wondering what wisdom you could give me, because I believe they are in the process, and maybe they have already implemented it, of a new design on the Social Security card. It will be a far different card than the one that I carry in my wallet, which was probably issued 40 years ago. The little blue and white spaces and red numbers are easily counterfeited and has been regularly counterfeited by the tens and hundreds of thousands.

Mr. DI PENTIMA. It still is today. When I left Social Security we had issued 404 million of those cards, 404 million numbers going back to 1935 when Social Security was enacted. Having chewed on this subject before particularly on the Senate side, as you know, Senator Moynihan has a great deal of interest also in the cards. The problem, simply put, is just to design a new card today doesn't do it, because anyone who is going to forge a card would just counterfeit the card that you have in your wallet and allege that they never received the new one.

So if you are going to put out a counterfeit-proof card you would have to replace all the cards that are in existence today. And I think by Social Security's measures and certainly the very fine people who work there can give you the exact numbers, but when I left we were talking about several billions of dollars to replace everyone's Social Security number in America, making sure we gave the right number back to the right person. That has always been the problem with that card.

Mr. HORN. Did they consider an alternative strategy? You don't have to replace all the cards.

Mr. DI PENTIMA. I agree. There are several alternative strategies. One, Social Security cards neither have a photograph nor a fingerprint and for a lot of historical reasons there are reasons why there are no fingerprints drivers licenses have all generally photographs and in most States they will issue a driver's license even if you are not a driver as a form of identification. Drivers licenses generally are key to a Social Security number as well and in many if not most States they are allowed to verify their records and do it against Social Security records to make sure that person is the person who they allege. I think some consideration should be given right there to the tying together of both the verification of Social Security information with the State licensing.

Mr. HORN. You will be pleased to know this subcommittee has taken that exact position. We have had witnesses, Mr. Veldy, who was one of the first three heads of the Law Enforcement Assistance Administration, and later the sole head of it when they moved from

the troika to unity of command, has made just that point as has the deputy director of Motor Vehicles in the State of California. California has both the fingerprint and the photo. I believe Michigan does not have the fingerprint, do they?

Mr. KOST. We don't even have a digitized photo. We intend to rebid it all this year and probably will go to fingerprints. We are not sure what version yet, whether it is going to be the 3-D bar code or the mag stripe. We have a photo now, but the photo is taken and laminated and that is it. There is no record. We intend to go to digitized photos, too.

Mr. HORN. You have the fingerprint now?

Mr. KOST. No.

Mr. HORN. I thought you didn't. My colleague, Mr. Ehlers of Michigan, claimed that there is no fingerprint and there is no question that is part of the problem here. We have fraud going on every day in this country with the Social Security cashed that is costing billions per year. The County of Los Angeles is about to have bankruptcy due to the charges of illegal aliens in the hospitals of Los Angeles County. Easily over \$1 billion a year is the loss to that county on hospital services because the Federal Government and the Social Security Administration in particular cannot control the situation with illegal aliens.

In the new legislation coming through, we have the 800 number check. What I have never understood, I have had the Social Security Commissioner before this committee a couple of times, and, yes, we are always going to do it and then nothing seems to happen. What worries me is what are some sensible things that experts in the use of information technology could be doing in terms of cross-checking these numbers?

It seems to me when you have got 82 people using the same fraudulent Social Security number, somewhere in the Baltimore headquarters a red light should go on that this account has had too many deposits or whatever, because employers are deducting and making payments unless they are taking it off the top knowing it is a fraudulent card. Do you have any advice for us on this?

Mr. DI PENTIMA. First of all, I wish former colleagues of Social Security were here because this is a subject that they give a great deal of thought to. If the Commissioner and former Deputy Commissioner were not fully responsive, it was not from lack of wanting to do so. In many, many staff meetings we discussed this issue.

One thing I would point out is that merely verifying the number, and we have built systems to verify the number, will only tell us that the person sitting across the desk in that hospital room, the number they gave matched the name and the number that we have on our records. We don't know that that person is the person who owns the card. If you tied it to a fingerprint and to a photo like with the drivers license then I think you have a much better system. But one of our concerns—we were preparing systems when I left to verify account numbers. But we also have to be able to assure that the person giving us that number is the person who they allege.

Mr. HORN. Well, we will get back to Social Security obviously this 1996.

Mr. DI PENTIMA. There are many good people there.

Mr. HORN. I know there are excellent people there, but you have a corporate culture that talks about it and doesn't do anything about it. That is what disturbs me. That is the government culture generally, I find. It is not limited to the Federal Government. I found the same thing in the State of California. Their attitude in Sacramento was if we haven't done it, it is because it hasn't been done anywhere.

But I would point out dozens of States in higher education were getting ahead of California, but they believed because they had a wonderful higher education system they assumed it would be a wonderful system. They didn't realize Texas now has a wonderful education system, North Carolina has it, Michigan has it. They are no longer the sole proprietor of that higher education in the United States.

And yet, you know, under three Governors I have listened to how they responded. Well, you can't be right because we haven't done it, you know. And I think you probably ran into some of that culture in the State of Michigan.

Mr. KOST. Absolutely. It was not invented here.

Mr. HORN. That is right.

Mr. KOST. It has also been done that way.

Mr. HORN. Our land needs a lot of visionaries, but you need a visionary with a baseball bat, I found. That gets results. Or the carrots that are very big and the stick that is obvious.

Let me ask here a question on the Michigan situation. When you got there, Mr. Kost, what percentage of Michigan's information technology has been outsourced before you got there and after you've been in office?

Mr. KOST. We need to separate operations from application development. Prior to my becoming CIO, nothing in the operations side was outsourced.

Mr. HORN. OK.

Mr. KOST. Now, we are in the process of outsourcing two very large data centers and all of our microtech support has already been outsourced.

Mr. HORN. What is the criteria as to what centers you will decide to outsource versus not source?

Mr. KOST. Well, I should tell you the ones that we have not outsourced are all Unisys and Group Bull-based systems, which we did a market analysis and discovered there were not a lot of competitors for either of those in the outsourcing world. So consequently we made the decision—business decision to do an internal consolidation rather than outsourcing.

All of our IBM stuff is being outsourced because there is plenty of competition for that business, No. 1, but No. 2, the IBM systems we were running were so ancient that we couldn't possibly bring them up-to-date ourselves anyway. So that was easy.

On the application development side, I would wager to guess prior to my assuming this position, it was probably on the order of 50/50, but now we are approaching probably 80/20 outsourced in the application development world. Virtually all that is left inside is small tweaking projects or some client server-based projects, but all the mainframe stuff is being outsourced.

Mr. HORN. Just to sum it up, if each of you would tell me either in running a program or as a consultant to it, what have you seen to be the major problem that delays movement in this area? Mr. Kost.

Mr. KOST. Turf.

Mr. HORN. What?

Mr. KOST. Turf.

Mr. HORN. Turf? OK, a jurisdictional matter?

Mr. KOST. Well, it isn't just jurisdiction. It is the not-invented-here thing. It is—there is a lot of protectiveness in the world. I will give you one very short anecdote. I had a data center manager come to me about 2 years ago and say, I need this new relational data base computer. He wanted to spend about \$9 million.

And I said, what are you going to use it for?

He said, well, it does all these wonderful calculations.

I said, I understand that, but what are you going to use it for?

He said, well, to do these calculations.

I said, no, no. You are a data center manager. Your customers are going to be doing those calculations. You send them back to see me and we will talk. I don't want to talk to you. We are not buying you any toys.

It is the issue of who is the customer, what problem are you trying to solve, what jurisdictions does it cut across absolutely and whose personal turf is it. And you have got process problems, technology problems. Those are all easy to solve from my perspective, assuming you have got leadership well enough to take them on, but the biggest issue is turf.

Mr. KINGHORN. I would say it is defining requirements, defining really what you want done. Probably in this day and age, in smaller bits, as someone suggested, and second, there really is a predisposition in the Federal Government, which I am familiar with, that government is so unique it cannot be outsourced. You cannot use off the shelf.

I have put an off-the-shelf system, financial system, in two organizations, one IRS, one EPA. The issues were the same. The IT folks in IRS who did not work for me fought it tooth and nail. And at the time back in 1990 they were in the 7th year of a 1-year program to bring up another system of their own. But just tremendous predisposition.

You even see it in RFP's, simple RFP's, where the Federal Government really suggests we are going to rank first public sector experience. If you have some private sector experience in this area, throw it in, but it is the public sector.

There needs to be a more opening up, and I think the new procurement reform will help that.

Mr. DI PENTIMA. I agree with what Mr. Kinghorn said about the initial critical fear. There is a general fear in the government of putting mission critical activities out to the private sector, a fear that at recompute time if you don't get a reasonable recompute or contractor and you have lost the capability of running a national program, in Social Security's case \$1 billion a day?

I would take heart, though, because the forcing function, as I see it, is the 272,000 less people. I can assure you today there are managers thinking about outsourcing things that they would not even

speaking about 3 years ago. The 272,000 FTE reduction is a forcing function and many good things, I think, are happening as well as things that we have to learn how to manage. One of them is a greater—a greater opportunity to look at outsourcing for mission-critical work.

Mr. HORN. Mr. Brooks.

Mr. BROOKS. I see the head count reduction in DOD being that kind of a forcing function. In just 2 years, things have changed dramatically. I think the foot dragging, if that is the right word for it, is partly a job security issue for the information technologists and they see outsourcing as a job security issue. But I think in the case of military medicine, support to active duty people, especially in Bosnia, by physicians and caregivers, is the mission. And the information technology support, while it is mission critical, it is not part of the mission. It is a mission support capability and therefore needs to be examined as an—a significant outsourcing opportunity and is recognized as such.

Mr. HORN. Training we have discussed with several panels. Is it your feeling that the training responsibility should be left with the agency that is administering the change in terms of information, resource technology, human resource technology, whatever, versus a central, say, Office of Personnel Management in the case of the Federal Government, Civil Service Commissions in the case of many State governments?

Where is the best place to hold responsibility for that training, to turn employees to the kind of systems that they are going to be using?

Mr. KINGHORN. I think one of the key issues you want to look at in that is that training in this area, certainly information management, is related to what you are going to train on. It is so dynamic. So I would clearly, as I have fought throughout all my career, stay away from having any central organization, create the internal capacity to train anybody.

The next question is, who does it? And I think much like the building of the technology itself, I think you want to keep up with the best and the brightest, and I think it is hard for large organizations such as the IRS to basically want to rebuild within their own capacity either. So, again, I think that is a legitimate area for major outsourcing.

Mr. KOST. I think the first obligation for training rests with the person who needs the training.

Mr. KINGHORN. Correct.

Mr. KOST. There is so much opportunity, there are so many publications out there that enable people to keep up that absent formal training, and that frequently isn't available in cutting edge stuff. It is up to the individual. Failing that, though, I believe with the previous comment. It has to be decentralized.

What we are doing is, I go back to my original bar graphs. As we consolidate, we are saving a lot of money for our State customers. We are letting them keep that money and reallocate it to do training for their people to move them in the application development arena. So they are going to have—it is their money.

They will be making the decisions about which personnel are going to be sticking around versus which positions are going to be

eliminated. They will be able to make the best decisions about what kind of training needs can be met, in conjunction with the employee rather than having it forced down from the top.

Mr. DI PENTIMA. I would take a slightly different point of view. I think that training should be decentralized to the agencies. I think that there should be a judicious use of outsourcing, but from my own experience, the very first thing that goes in a constrained budget is training, a lot of times because the training has travel related to it. I would probably earmark training funds in the budget process, if I, in fact, thought training was important and wanted to have it done.

Probably most excellent companies top out at about 5 percent of administrative costs spent on training. I doubt that you will find a Federal agency that spends a half of 1 percent of its administrative budget on training. It is just very easy to give up, and they do.

Mr. HORN. Mr. Brooks.

Mr. BROOKS. DOD spends a good deal more than a half a percent in health affairs in CHCS-specific training as part of implementation. It is decentralized. It is effective. Training is what enables people to succeed, positions them for success within new business processes that are supported by information technology. So you kind of have to reverse engineer from the skills that people need to work within a business process that is supported by the information technology. And that has all stayed well wired together.

It is largely outsourced, highly decentralized and metrics are in place which show more than 90 percent trainee satisfaction, good or excellent marks. So it is something we think is important. It is earmarked. We measure it and we pay attention to it.

Mr. HORN. Well, I thank you gentlemen. There will be a few questions we will send to you, if you don't mind responding in your succinct way. We have learned a lot from this panel. Your experience with a variety of agencies has been immensely helpful as we try to decentralize government down to the States and localities and nonprofits and also reorganize a lot of the government departments in terms of getting rid of some of the intermediary regional structure—and I mentioned this morning the Social Security offices, which you are quite familiar with—the importance of meeting with the ultimate consumer, which is the taxpayer of the United States, as opposed to having everything decided in Washington.

So we are following Governor Engler's lead and we thank you for coming.

Let me just announce the majority and minority staff that have been responsible for this hearing, which has been well done. J. Russell George, the staff director and counsel of the subcommittee; Mark Uncapher, who sits to my left, the professional staff member and counsel on this area subject matter; Susan Marshall, procurement specialist for the subcommittee and full committee; and our faithful clerk, Andrew Richardson that has a lot to do with the amenities. And the minority staff members, David McMillen, Mark Stephenson, and our two official reporters, Marcia Stein and Mindy Colchico. So thank you all. We appreciate it.

With that, the hearing is adjourned.

[Whereupon, at 12:45 p.m., the subcommittee was adjourned.]

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